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MOLL (F.). **Holzschutz im Wandel der Zeiten.** [Timber preservation through the ages.]—*Holzmarkt, Berl.*, liii, 192, 196, 198, 200, 7 pp., 5 figs., 1936.

Attempts at wood preservation against fire and sea damage, insect depredations, and fungal decay have been made since the days of remote antiquity, and an interesting account is here presented of its gradual development from very primitive beginnings to the highly technical and scientific process in general use to-day.

BERTRAND (G.) & DE WAAL (H. L.). **Recherches sur la teneur comparative en bore de plantes cultivées sur le même sol.** [Studies on the comparative boron content of plants cultivated on the same soil.]—*Ann. Inst. Pasteur*, lvii, 2, pp. 121–126, 1936.

A tabulated account is given of the writers' analyses, by a colorimetric method, of the boron content of a number of different plants cultivated on the same soil, from which it appears that the amount of this element varies greatly—from 2·3 mg. per kg. of dry matter in barley to 94·7 mg. in poppy. The other cereals are also poor in boron, rye, wheat, and maize showing 3·1, 3·3, and 5 mg. per kg., respectively, while the Leguminosae, for instance, are richer, containing between 35 and 70 mg. Of the two Chenopodiaceae tested, the boron content of spinach is only 10·4 mg., while that of beets is relatively high (75·6). In this connexion attention is drawn to the natural weakening of resistance to heart rot of beets [*R.A.M.*, xvi, p. 11], with their normally abundant supply of boron, through cultivation in soil receiving nothing but synthetic fertilizers from which this element is virtually absent.

GRAM (E.). **Bormangel og nogle andre Mangelsygdomme.** [Boron deficiency and some other deficiency diseases.]—*Tidsskr. Planteavl*, xli, 3, pp. 401–449, 10 figs., 1 diag., 1936. [English summary.]

Brown heart of swedes [see next abstract] has been most serious in Denmark in dry years on light calcareous soils. Experiments from 1931 to 1935 confirmed the Canadian results that the disease is controlled by the application of 15 kg. borax per hect. Increasing the P_H of the soil by liming resulted in a corresponding increase in the incidence of the disorder, while the incorporation of sulphur (400 kg. per hect.) depressed the P_H from 7·0 to 5·8 and markedly improved the quality

of the roots. The liberal use of farm or liquid manure, sodium or calcium nitrate, or especially ammonium sulphate reduced the extent of brown heart, which was aggravated, on the other hand, by calcium cyanamide. Heart and dry rot of sugar beets [see preceding abstract] and mangolds was also prevented by applications of 15 kg. borax per hect., 30 kg. being rather more profitable in severe outbreaks. Treatment in August after the disease appeared was fairly effective. A strong residual effect of the borax was manifest the second year after treatment.

In 249 experiments in the control of reclamation disease [*R.A.M.* xv, pp. 72, 792] by the application to the soil of 50 kg. copper sulphate per hect., the average increase in the barley and oats yields amounted to some 500 kg. per hect. The dressing of moor soils with sand, or better still clay (or marl on lime-deficient soil) is advantageous. In addition to the hosts of grey speck in Denmark already listed [ibid., xv, p. 73], the disease is stated to affect spinach, tomatoes, timothy [*Phleum pratense*], and tall oat grass [*Arrhenatherum avenaceum*]. In 70 experiments in the control of this disturbance in oats, barley, and mixed stands of these two crops, the application of 50 kg. manganese sulphate per hect. increased the output by an average of 430 kg. per hect. Grey speck is rare on sandy soils with a P_H of less than 6·0 and on clay lower than P_H 7·5. Sulphate of ammonia (200 kg. per hect.) or ground sulphur is also effective against this disease.

Jamalainen (E. A.). **Tutkimuksia lantun ruskotaudista.** [Investigations on brown heart of Swedes.]—*Valt. Maatalousk. Julk.* 72, 116 pp., 26 figs., 4 diags., 1935. [Finnish, with German summary. Received November, 1936.]

An exhaustive, fully tabulated account is given of the writer's studies in Finland on brown heart of swedes and its control by the enrichment of the soil with boron [*R.A.M.*, xv, p. 475].

Woodcock (J. W.). **Brown-heart (mottled heart) in Swedes. Report on field trials with borax.**—*N.Z. J. Agric.*, liii, 2, pp. 99–104, 1 fig., 1936.

In experiments carried out in New Zealand on the control of brown heart of swedes [see preceding abstracts], the application of fertilizer mixed with borax (10 lb. per acre) was completely successful in six trials, and considerably reduced the incidence of the condition in a further six, while no brown heart developed in the four remaining experiments. Germination was adversely affected by the borax in four instances.

It is recommended that the borax should be applied at the rate of 20 lb. per acre, mixed with fine, dry sand and broadcast over the soil just before sowing. If applied with fertilizer and sown with the seed, not more than 8 lb. per acre should be used, to avoid germination injury. Fertilizers should not contain free lime, and where the condition is prevalent liming should not be effected immediately before sowing.

Coons (G. H.). **Improvement of the Sugar Beet.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 625–656, 7 figs., 1936.

In this account of the breeding of sugar beets the author states that

the new curly top-resistant varieties U.S. 33 and U.S. 34 [*R.A.M.*, xv, p. 418] will probably come into use in the United States on a large scale in 1937.

Work on the development of sugar beet strains resistant to *Cercospora* leaf spot [*C. beticola*: ibid., xiii, p. 611; xv, p. 764] has been in progress since 1925. The data obtained show that some progress can be made by selection under severe epidemic conditions. The absence of highly resistant individuals in present commercial stocks makes it almost impossible to select on a basis of the degree of leaf infection, but by using criteria based on weight development and sucrose content improved strains have been obtained. By means of selection and inbreeding, lines of beets stabilized in resistance have been secured to serve as a basis for the production of hybrids or synthetic varieties. The lines so far secured are highly resistant but insufficiently productive for commercial purposes. The first large-scale use of the resistant lines will be possible in 1937 with two synthetic varieties, accessions 217 and 220.

Nielsen (O.). **Varmvandsbehandling af Kaalfrø.** [Hot water treatment of Cabbage seed.]—*Tidsskr. Planteavl*, xli, 3, pp. 450–458, 1936.

Excellent control of *Alternaria brassicae* (Berk.) Bolle [*R.A.M.*, xv, p. 188] and *A. circinans* [*A. oleracea*: ibid., xiv, p. 494] in white cabbage and cauliflower seed is stated to have been obtained in Danish experiments from 1934 to 1936 by 30 minutes' immersion in water heated to 45° C. or 20 at 50°, while substantial elimination was secured by 30 minutes at 40°. The treatment further exercised a very beneficial effect on germination, the incidence of which was increased by up to 13 per cent. A number of miscellaneous fungi (*Penicillium* and *Mucor* spp. and the like) occasionally found contaminating cabbage seed are also amenable to the hot water treatment.

Jamalainen (E. A.). **Herneen siementen sisäinen turmeltuminen.** [Internal necrosis of Pea seeds.]—*Valt. Maatalousk. Julk.* 79, 6 pp., 2 figs., 1936. [Finnish, with English summary.]

Previous literature on internal necrosis (marsh spot) of peas [*R.A.M.*, xv, p. 767] is summarized, and a brief note given on the occurrence of the disease in the Ahvenanmaa archipelago of south-western Finland, whence it was first reported in 1929, causing 6·5 per cent. infection of the sample submitted for examination. In 1933 a batch of 7,000 kg. of pea seed from the same district showed 8·3 per cent. damage from marsh spot. The germination percentages of selected healthy and diseased seeds from the sample under observation were 80·9 and 62·5 per cent., respectively; no evidence of the transmission of the disorder through the seed was obtained. It is thought that the disease is undoubtedly due in Finland and elsewhere to peculiarities associated with the district where the crop is grown.

Zaumeyer (W. J.) & Wade (B. L.). **Pea mosaic and its relation to other legume mosaic viruses.**—*J. agric. Res.*, liii, 3, pp. 161–185, 4 figs., 1936.

Continuing their studies on the virus diseases of leguminous crops [*R.A.M.*, xv, p. 274] the authors found that pea mosaic is present in

the Western United States wherever peas are cultivated, but is more serious in the varieties grown for marketing as green peas or for seed than in the canning varieties. The disease was usually more severe along the borders than inside the fields, suggesting the transmission to peas of other legume viruses, a suggestion which was confirmed by cross inoculations which demonstrated that the mosaic viruses of red clover (*Trifolium pratense*), white clover (*T. repens*), white sweet clover (*Melilotus alba*), and alsike clover (*T. hybridum*) are infectious to peas. While under certain environmental conditions the symptoms [which are described in some detail] produced by these viruses may be similar to those of the common pea mosaic, the viruses of the white and alsike clovers and of white sweet clover can be differentiated from those of the pea and red clover mosaics by means of the Dwarf Telephone, Tall Telephone, and Green Giant pea varieties, on which the white clover and white sweet clover viruses produced, in addition to the usual mottled symptoms, necrotic lesions on the inoculated stems and leaves. The symptoms produced by the viruses of pea and red clover mosaic are very similar, and it is believed the two viruses are identical. The six viruses studied may also be separated, apart from symptomatological differences, by their reaction on the Stringless Green Refugee, Corbett Refugee, Robust, and Resistant Great Northern Idaho No. 1 bean varieties, and on *Vicia faba*.

Of the 42 [listed] varieties of pea which were tested, ten proved immune from the pea mosaic and eight from the red clover virus; three varieties out of 40 did not show the mottled symptoms of white clover virus, but all exhibited necrotic lesions, and only one appeared to be highly tolerant. The white sweet clover virus produced mottled symptoms on 38 and necrotic lesions on 39 varieties, and seven varieties were immune from alsike clover virus 1. In a special series of tests it was shown that out of 3,057 seeds collected from virus-diseased pea plants only 11 transmitted the disease.

WAGER (V. A.). **Bacterial wilt and blight of French Beans.**—*Sci. Bull. Dep. Agric. S. Afr.* 149, 19 pp., 11 figs., 1936.

A description is given of bacterial blight of French beans (*Phaseolus vulgaris*), which in South Africa was attributed in 1918 to *Bacterium phaseoli* [*R.A.M.*, xv, p. 765], but is now shown to be due for the most part (in all cases except two of those examined) to *Phytomonas* [*Bact.*] *medicaginis* var. *phaseolicola* [ibid., xv, p. 782], though the former organism occurs sporadically. The disease has caused considerable losses in eastern and southern Transvaal since 1930, but the incidence varies from crop to crop and season to season. The worst epidemic appeared throughout the Tonetti district of the eastern Transvaal at the end of the autumn of 1935; this attack was induced by a severe storm, and hundreds of acres produced no crop. Seed from the same source sown in adjacent patches after the storm gave no disease, so that the soil must have been heavily infected, the splashing caused by the storm setting up infection.

Wound inoculations in the stems with *Bact. medicaginis* var. *phaseolicola* led to the death of the plants in periods ranging from 10 days to 4 weeks. Great variation in virulence of the isolations was also observed

when injured and uninjured leaves were inoculated, and the fact that the latter inoculations were successful confirmed the existence of positive stomatal infection. In general infections resulted from the use of diseased seed, temperature and humidity probably exerting a considerable effect on the amount of disease developing. No infection of the roots took place from diseased soil.

Seed treatment does not appear to give satisfactory results, but the sorting out of all visibly infected seeds eliminates practically all initial infection, and is strongly recommended as the first step to producing a clean crop. Of the following comparatively resistant varieties, viz., Magpie, Superlative, Abondant, Ne Plus Ultra, Unrivalled, Asgrow's Black Valentine, Sutton's Prince, Black Prince, Vilmorin's Dwarf Lignereux, and Black Wonder, the four last are the best and conform most closely to South African requirements. Black Wonder has been grown on a large commercial scale for two seasons with great success.

Galatchyan (R. M.). Бактериозы Фасоли, их вредоносность, распространенность и пути инфекции. [Bacterioses of French Beans, their injuriousness, distribution, and modes of infection.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 513–515, 1936.

A survey in 1935 showed that French beans [*Phaseolus vulgaris*] on the Azoff-Black Sea littoral are attacked by *Bacterium phaseoli* and its var. *fuscans* [*R.A.M.*, xiv, p. 565], *Bact. medicaginis phaseolicola* [see preceding abstract], *Bact. vignae* [cf. ibid., xv, p. 16] and its var. *leguminiphila* [ibid., xiv, p. 565] and *Bact. heteroceum* [ibid., xv, p. 749], among which the first-named is stated to be economically the most important. While no varieties of French beans have yet been found entirely immune from bacterial diseases, certain varieties, such as 'Tepari' and 'Sladkaya Parnaskaya' are comparatively resistant.

Bennett (L. S.). **Studies on the inheritance of resistance to wilt (Fusarium niveum) in Watermelon.**—*J. agric. Res.*, liii, 4, pp. 295–306, 1 fig., 5 graphs, 1936.

A brief account is given of work in West Virginia, in which an inedible watermelon imported from Russia, resistant to wilt (*Fusarium* [*bulbigenum* var.] *niveum*) [*R.A.M.*, xvi, p. 14], was crossed with the susceptible commercial Early Fordhook variety. The results of tests of the reactions of the F_3 hybrids and of the progenies of selfed back-cross plants in the greenhouse, to three physiological strains of the parasite showed that a larger proportion of the families from back-crosses to the Russian parent were resistant, than of the families from back-crosses to the susceptible parent, indicating that resistance to wilt is inherited. There was also evidence of transgressive segregation. The fact that the F_3 progenies and the back-cross families could not be divided into distinct resistant and susceptible groups suggests that resistance is probably dependent on several factors; there was an indication that at least a part of these factors is cumulative in its action, since the reaction of the F_1 progenies was intermediate between that of the parents. No close linkage was apparent between resistance and any of the other characters studied, so that it may be possible eventually to combine resistance and commercial quality in the same melon.

WILLIAMS (P. H.). **A disease of Mushrooms new to Great Britain.**—*Gdnrs' Chron.*, c, 2591, p. 147, 1 fig., 1936.

In July, 1936, *Pseudobalsamia microspora* [*R.A.M.*, xv, p. 138] was detected in a mushroom [*Psalliota campestris*] bed at the Cheshunt Experimental and Research Station, this being the first record of the fungus in England. It occupied the casing soil and the superficial layers of the compost, forming a dense mycelial mat with numerous cream-coloured to reddish-brown, subspherical to discoid, irregularly lobate ascocarps, $\frac{1}{8}$ to 1 in. in diameter. *Pseudobalsamia microspora* does not appear to parasitize the mushrooms themselves, but spreads through the beds in such a way as to impede their proper development. The occurrence of this new disease is a further argument in favour of the routine sterilization by heat of all soils intended for the casing of mushroom beds.

RUI (D.). **Relazione sul funzionamento degli osservatori antiperonosporici della provincia di Treviso.** [Report on the activities of the anti-mildew forecasting stations in the province of Treviso.]—*Annu. Staz. sper. Vitic. Conegliano*, v, pp. 241–284, 1935. [Received November, 1936.]

Reviewing the data [which are tabulated] supplied during 1934 by the stations set up in the province of Treviso, Italy, for forecasting attacks of vine mildew (*Plasmopara viticola*) [*R.A.M.*, xii, p. 199], the author concludes that one to four superfluous spray applications were obviated as a result of the warnings issued by the stations.

Plantesygdomme i Danmark 1935. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1935. Survey of data collected by the State Phytopathological Service.]—*Tidsskr. Planteavl*, xli, 4, pp. 533–570, 4 figs., 2 graphs, 1936. [English summary.]

In addition to information already noticed from other sources, this report contains the following items of interest [cf. *R.A.M.*, xv, p. 72]. Potato wart (*Synchytrium endobioticum*) was found in 27 new municipalities [ibid., xvi, p. 56]. Hazel nuts [*Corylus avellana*] affected by brown rot consistently yielded *Monilia* [*Sclerotinia*] *fructigena*. A new bacterial leaf spot occurred on *Aspidistra*. *Phyllosticta richardiae* [ibid., xi, p. 517] was responsible for widespread spotting of leaves of *Zantedeschia* [*aethiopica*]. New records for the country are *Didymascella thujina* [ibid., xiv, p. 794] on *Thuja plicata*, *Erysiphe* sp. on *Kalanchoë* [cf. ibid., xiv, p. 637], and *Phytophthora* (?) *cactorum* on strawberries [ibid., xii, p. 266].

MCDONALD (J.). **Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Kenya, 1935*, ii, pp. 1–15, 1936.

An alleged break-down in the resistance of Blue Mountain coffee to coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xv, p. 482] in the Kipkarren district, Kenya, was ascertained to be due to its free admixture with other varieties. Coffee given good cultural methods and sprayed in January and July with 1 per cent. Bordeaux mixture showed 4·3 and 9·1 per cent. infection for multiple- and single-stem plants,

respectively, as against 14 and 25·8 per cent. in the corresponding unsprayed controls. Multiple- and single-stem coffee sprayed annually since 1932 in March and July with 0·5 per cent. Bordeaux mixture in 1935 showed 11·2 and 13·6 per cent. infection, as against 22·4 and 31·9 per cent. in the controls.

Blue Mountain appears from preliminary observations to be resistant to the Elgon die-back [ibid., xv, p. 214].

By far the most prevalent form of wheat stem [black] rust [*Puccinia graminis*] was K4 [ibid., xv, p. 483].

Germination tests with maize seed from two ears, one apparently unblemished, the other with a slightly dull pith, showed the former to be much the more vigorous and almost entirely free from ear rot (*Fusarium moniliforme*) [*Gibberella moniliformis*], though over half the seed from the dull ear became infected.

Sorghum seed dusted with agrosan G and abavit B gave, respectively, 1·2 and 2·1 per cent. smut (*Sphacelotheca sorghi*) in the resultant crop, as against 26·4 per cent. in the untreated control [ibid., xv, p. 558].

Linseed seedlings raised from Njoro seed were affected with a species of *Rhizoctonia*, believed to be *R.* [*Corticium*] *solani*, inoculations with which proved it to be highly virulent.

Lilium philippinensis and *L. harrisii* plants in a commercial nursery were affected by a disease apparently identical with the third type of Easter lily mosaic described by Ogilvie and Guterman [ibid., viii, p. 577].

New records included anthracnose of banana fruits (*Gloeosporium musarum*), *R. bataticola* [*Macrophomina phaseoli*] on groundnut roots, *Puccinia menthae* [ibid., xv, p. 527] on *Mentha piperita* and *M. arvescens* var. *piperascens*, and *Cladosporium cucumerinum* and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* on cucumber.

STOREY (H. H.). **Report of the Plant Pathologist.**—*Rep. E. Afr. agric. Res. Sta., 1935–36*, pp. 11–14, 1936.

This report [cf. *R.A.M.*, xv, p. 203] contains the following items apart from those already noticed from other sources [ibid., xv, pp. 529, 645]. Two quite distinct virus diseases are now known to affect cassava in the Amani district, and probably elsewhere in East Africa. One is the well-known mosaic [ibid., xv, pp. 204, 701]. The other, which appears to have been present locally for several years, but unrecognized, is characterized by dark brown stripes on otherwise green stems and a yellow mottling of leaves in the later stages of growth. The stem lesions remain as sunken areas when the stem heals over, and if badly affected the stem readily breaks off at ground-level. The condition is transmissible by grafting and is independent of mosaic, though both diseases often occur on one plant. The leaf mottle is suggestive of nutritional deficiency, rather than a virus disease. Most of the affected plants growing during the cool season in 1935 in Amani lost all their stems by breakage and only shootless stumps remained, but with a rise in temperature the plants recovered to a large extent. At temperatures most favourable to the growth of cassava the effects of the disease are relatively mild.

The local cassava mosaic strains fall into two groups, those producing

a severe yellow mosaic with extreme leaf distortion and general stunting, and those producing a mild, green mosaic with little general ill effects. The attempt to obtain immunity from the severe strains by infection with the mild ones definitely failed, while control by breeding from the local varieties does not appear at all promising. A marked seasonal difference in the rate of secondary spread was observed during the last two years.

Forty-ninth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1935–1936.—44 pp., 1 fig., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xv, p. 559]. During the period under review over 6,000 mosaic peach [ibid., xv, p. 816] trees were eradicated from the Palisade-Grand Junction area, to which the disease is confined. Two of the 14 species of insects tested for their capacity to transmit mosaic under orchard conditions were proved to be implicated in the spread of the disease. So far the control measures adopted have been 60 to 70 per cent. effective, so that there is every hope of eliminating all centres of infestation in a few years.

Part of the work on potato improvement consists in inbreeding on several varieties and seedlings and making crosses between Katahdin and Russet Rural, Katahdin and Irish Cobbler, and Seedling 252 and Rural with a view to developing earlier maturing seedlings with increased resistance to scab [*Actinomyces scabies*: ibid., xvi, p. 58] and virus diseases. The Chippewa variety, which is being tested in the potato-growing sections of the State, is more susceptible to scab than Katahdin.

Levine (M.). **Plant tumors and their relation to cancer.**—*Bot. Rev.*, ii, 9, pp. 439–455, 1936.

Following an introductory section on the possible bearings of crown gall (*Bacterium tumefaciens*) in plants on the study of human cancer [*R.A.M.*, xv, p. 205 *et passim*], the writer summarizes and briefly discusses a number of outstanding contributions to this problem under the headings of tumour emboli and metastases, tumour strands, location of bacteria in the host, and cytology of crown-gall tissue, a bibliography of 88 titles being appended.

Pichler (F.). **Saatgutbeizmittel.** [Seed-grain disinfectants.]—*Neuheiten PflSch.*, xxix, 5, pp. 181–183, 1936.

A list is given of the seed-grain disinfectants tested and recognized as efficacious in liquid or dry form against various fungal diseases by the Austrian Plant Protection Service [cf. *R.A.M.*, xiv, p. 518], among which may be mentioned the following steeps: agrostan supplied by Treibacher Chem. Werke, Vienna, for the control of wheat bunt [*Tilletia caries* and *T. foetens*], covered smut of barley [*Ustilago hordei*], and rye *Fusarium* [*Calonectria graminicola*]; cersolit (F. J. Kwizda, Korneuburg, near Vienna), Einheitsbeize-Kreidl (V. C. F. Kreidl, Heller & Co.), and fenoform (Aktienfabrik zur Erzeugung von Chemikalien, Neu-Erlaa) against wheat bunt (the two last-named also used as a sprinkle); and salvocer (Kreidl, Heller & Co.) against wheat bunt

(also as a sprinkle), *U. hordei* on barley, *C. graminicola* on rye, and loose smut of oats [*U. avenae*]. In dust form agrostan controls wheat bunt, covered smut of barley, and *C. graminicola* on rye; cersolit, Einheitsbeize-Kreidl, porzol [ibid., xiii, p. 11], salvocer, and tritisan (Vedepha, Vienna) are effective against wheat bunt; stripe disease of barley [*Helminthosporium gramineum*] may be combated by porzol; and *U. hordei* on barley and *C. graminicola* on rye by salvocer.

SIBILIA (C.). **Ricerche sulle ruggini dei cereali. VI. La specializzazione della 'Puccinia graminis tritici' Erikss. et Henn. in Italia.** [Researches on cereal rusts. The specialization of *Puccinia graminis tritici* Erikss. & Henn. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 95–98, 1936.

In June, 1935, the author made collections of *Puccinia graminis tritici* from wheat and *Berberis aetnensis* in three localities in Italy, inoculations with which on 12 wheat varieties showed them to consist of physiologic forms XL and XVII, the latter being the form found on *B. aetnensis*, a host restricted to a very few parts of Italy. McDonald's form K2 [*R.A.M.*, xv, p. 483] from Kenya is stated to be the same as form XVII.

SIBILIA (C.). **La diffusione dei 'Berberis' in Italia in rapporto alla Puccinia graminis Pers.** [The distribution of *Berberis* in Italy in relation to *Puccinia graminis* Pers.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 139–145, 1936.

In connexion with his study of the physiologic forms of *Puccinia graminis tritici* [see preceding abstract] the author surveys in some detail the geographical distribution of *Berberis vulgaris* and *B. aetnensis* in Italy, where only these species of barberry are present. It would appear that while *B. vulgaris* is not uncommon, it is chiefly confined to northern Italy, the Alps, and the Appenines as far as the border of Tuscany. In central and southern Italy it is much less prevalent and increasingly gives place to *B. aetnensis*. In Sicily and Sardinia (and also in Corsica) only *B. aetnensis* occurs. In northern Italy, at least, the rust certainly overwinters partly on *B. vulgaris*, the climate being too cold to allow uredospores always to persist. In view of the abundance of this host on the Alps hitherto undescribed forms of the rust are expected to be present.

SIBILIA (C.). **Ricerche sulle ruggini dei cereali. V. Ulteriori ricerche sulla specializzazione della 'Puccinia triticina' Erikss. in Italia.** [Researches on cereal rusts. V. Further researches on the specialization of *Puccinia triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 69–75, 1 map, 1936.

In continuation of his studies of the physiologic forms of *Puccinia triticina* [*R.A.M.*, xv, p. 83; xvi, p. 25] the author during 1935–6 made 16 collections which inoculation tests on eight standard wheat varieties showed to consist of eight new physiologic forms and two already known, viz., forms XXV from Catanzaro, and LVIII from Borgo Velino and Barcellona (Messina). The new forms are numbered LXVII P to LXXIV P (the letter P indicating that the enumeration is provisional

and intended to stand only until the identity of the forms has been officially cleared up) and their distribution is clearly shown on a map. Most of these forms were of medium virulence, though LXIX P, the most virulent, was an exception, leaving only the Malakoff variety unaffected. The least virulent form was LXXIV P, which produced no pustules on the Malakoff, Webster, and Loros varieties, and only slight infection on Carina and Hussar wheats. The least virulent physiologic form of *P. triticina* in Italy is still form XV. Practically all the Italian forms produce no pustules on Malakoff (except LIX and LX) and show maximum infection on Bravit and Mediterranean wheats (except XV and LX). The only form so far found common to Europe and America appears to be XI. This work brings the number of physiologic forms of *P. triticina* found in Italy up to 18, of which only forms XV and XXV were previously known elsewhere. Forms LVIII and LXXIII P have both been found in widely separated localities.

WALDRON (L. R.). **The effect of leaf rust accompanied by heat upon yield, kernel weight, bushel weight, and protein content of hard red spring Wheat.**—*J. agric. Res.*, liii, 6, pp. 399–414, 1936.

A tabulated account is given of comparative studies in North Dakota of the effect of leaf [brown] rust (*Puccinia triticina*) on the yield of 20 selections each of four Ceres × (Hope × Florence) hybrid wheat families in 1934 and 1935; in both years the growing seasons were drier and hotter than normal, but in 1935 excessively hot weather was limited to the month of July, during which the average daily temperature was 2·7° F. above that in 1934. The maximum average infection for any family was only 13 per cent.

Of the four hybrid families studied, the one that exhibited a high degree of resistance to leaf rust and flecking maintained its yield in 1935, as compared with 1934, in spite of the excessive heat, whereas the second family, resistant to the rust but somewhat susceptible to flecking, showed in 1935 a loss in yield of 16 per cent., and the other two families, both of which were more susceptible to rust and to flecking, showed in comparison with 1934 losses of 19 and 28 per cent., respectively. These reductions in yield were shown to be mainly due to reduced size of the wheat grains (as judged by the weight of 1,000 grains), since almost no shrivelling of the grain was observed. Weights per bushel were also less in 1935 than in 1934, but the reduction was decidedly smaller than for yield and weight of 1,000 grains. The grain of the two families showing freedom from and resistance to leaf rust had a higher protein content in 1935 than in 1934, while the two susceptible families did not show any increase, clearly suggesting that the protein content was reduced by the presence of the rust.

FISCHER (G. W.). **The susceptibility of certain wild grasses to Tilletia tritici and Tilletia levis.**—*Phytopathology*, xxvi, 9, pp. 876–886, 3 figs., 1936.

Specimens of crested wheatgrass (*Agropyron cristatum*), in which practically every floret contained a bunt (*Tilletia tritici*) [*T. caries*] ball, have been found in field plantings in Washington and used as a source of inoculum for wheat. Hybrid 128 proved to be the most susceptible

of the nine winter wheat varieties tested, with 63·1 per cent. bunted heads, Turkey showing 8·53 per cent., and Ridit, Oro, Albit, Martin, Hohenheimer, White Odessa, and Hussar 2 per cent. and under [*R.A.M.*, xvi, p. 27]. Hard Federation, the only spring wheat tested, contracted 65 per cent. infection. On the basis of these varietal reactions the bunt collection from *A. cristatum* conforms to Bressman's physiologic form VIII [ibid., xi, p. 33] and Gaines's T_1 [ibid., xii, p. 617].

Of 22 selections of *A. cristatum* tested, 13 were more or less susceptible to *T. caries*, 6 to *T. levis* [*T. foetens*], and 3 to both, the corresponding figures for 25 strains of *A. pauciflorum* being 14, 5, and 5, respectively. *A. subsecundum* (*A. caninum*) was also susceptible to certain physiologic forms of both bunt species and *Hordeum nodosum* L. [*H. secalinum*] to *T. caries*.

GAUDINEAU (Mlle M.). **Le traitement des semences contre la carie du Blé.** [Seed treatment against Wheat bunt.]—*J. Agric. prat., Paris*, N.S., c, 39, pp. 221–222, 1936.

Wheat bunt [*Tilletia caries* and *T. foetens*] is stated to have been very prevalent in the Oise, Aisne, and Yonne districts of France in 1936, following a mild, damp winter, the stands chiefly affected (with an incidence of at least 20 per cent.) being those sown during the second fortnight of October. Directions for control by several approved methods are given [*R.A.M.*, xv, p. 638].

HAGBORG (W. A. F.). **Black chaff, a composite disease.**—*Canad. J. Res.*, xiv, 9, pp. 347–359, 1 pl., 1936.

The results of investigations from 1931 to 1934 showed that in Canada the condition of wheat previously referred to as black chaff [*R.A.M.*, xv, p. 489] really consists of three different types, the first characterized by water-soaked areas or by sharply delimited discoloration, chiefly confined to the chlorenchyma of the empty glumes, but sometimes also affecting the distal end of the lemmas and the upper part of the peduncles; the second by the fact that the margins of the discolorations are not sharply delimited but diffused throughout the tissues, chiefly of the lemmas, the florets being often sterile with the ovary and stamens frequently overgrown with mycelium; and the third by black discolorations (melanism) of the internodes. Isolations from the first type (for which the term bacterial black chaff is adopted) yielded numerous bacteria, the most prevalent of which conformed in its cultural characters with *Phytomonas* [*Bacterium*] *translucens* var. *undulosum* [loc. cit.], while *P.* [*Bact.*] *atrofaciens* [ibid., xiv, p. 297] was also occasionally present. Inoculation by smearing or spraying wheat seedlings with suspensions of *Bact. translucens* var. *undulosum* only gave a small percentage of successful infection, whereas 100 per cent. infection typical of black chaff was obtained by needle inoculations into the coleoptiles and enclosed primary leaves, and the organism was recovered from the lesions. Isolations from the second type consistently yielded a species of *Alternaria* resembling *A. tenuis*, which reproduced the condition when inoculated into healthy wheat seedlings. The third type failed to yield any pathogenic organism, and was experimentally

reproduced in Pentad × Marquis wheat (R.L. 723) by keeping the plants in moist chambers at about 25° for periods of from 36 to 60 hours, indicating that the condition is physiological in origin, and directly attributable to enclosure in the moist chamber since controls at the same temperature were unaffected.

Stevens (H.). **The effect of latent infection on the smut-resistant Markton Oat**—*J. Amer. Soc. Agron.*, xxviii, 9, pp. 711–713, 1936.

Experiments conducted from 1932 to 1934 at Aberdeen, Idaho, showed that inoculation of the resistant Markton oats seed-grain with smut (chiefly *Ustilago levis* [*U. kolleri*] with a slight contamination of *U. avenae*) [*R.A.M.*, xv, pp. 642, 711, 712] results in the destruction of many seeds, thereby reducing the stand. After the plants emerge and become established, however, no detrimental effects are apparent. It is thus evident that a certain adverse influence is exerted by the disease even in the absence of obvious symptoms, but under normal field conditions smut is not likely to be a limiting factor in a resistant variety, which would produce practically no inoculum for the natural infection of the succeeding crop. The susceptible Idamine variety, used as a comparison in these tests, developed several abnormalities as a sequel to inoculation, including unusually small and irregular panicles and the extensive production of 'false nodes'.

Gerretsen (F. C.). **Een onderzoek naar de oorzaken der Veenkoloniale Haverziekte.** [A study on the causes of grey speck of Oats.]—*Versl. RijkslandbProefst., 's Grav.* 42 (1), A, 67 pp., 17 pl., 1936. [German summary.]

The substance of the writer's investigations on the correlations between manganese deficiency, soil bacteria, and grey speck of oats [*R.A.M.*, xv, p. 791], a comprehensive, tabulated account of which is here presented, has already been noticed from another source [ibid., xv, p. 356].

Vilkaitis (V.). **Šiaudines Rugiu kūles.** [Stripe smut of Rye.]—*Yearb. agric. Acad. Dotnuva*, x, 2, pp. 131–141, 1 fig., 2 graphs, 1936. [Lithuanian, with German summary.]

Recent experiments in Lithuania are stated to have shown that the spores of stripe smut of rye (*Urocystis occulta*) [*R.A.M.*, xv, p. 644] survive the winter in the soil and retain their viability until the following spring. When spores of the fungus were strewn in the summer or autumn on the plots destined for spring planting the crop contained diseased haulms; in one test infection from this source amounted to 0·56 per cent. and in another to 0·4 and 0·7 per cent. The smutted haulms of the Svalöf's Star and Vierzbna varieties were up to 45 per cent. shorter than healthy ones, not owing to a reduction in the number of internodes, which in fact exceeded that of the sound plants by 14 per cent., but to the curtailment of the individual nodes, especially those of the ear. None of the eight varieties tested for their reaction to *U. occulta* showed any marked degree of resistance, the average incidence of infection in the three years' trials ranging from 10·77 (Dankow) to 34·86 per cent. (local selection), respectively.

Frommherz (A.). **Die Bekämpfung der Ackerschnecke (Limax agrestis) und des Schneeschimmels (Fusarium nivale). Zwei gefährliche Feinde der jungen Roggensaat.** [The control of the common slug (*Limax agrestis*) and of the snow mould (*Fusarium nivale*), two dangerous pests of young Rye seed.]—*Dtsch. landw. Pr.*, lxiii, 37, p. 466; 38, p. 478, 1936.

Recommendations are made for combating snow mould of rye (*Fusarium nivale*) [*Calonectria graminicola*] in Baden, Germany, by judicious cultural measures, such as the selection of open sites (avoiding a northerly exposure), sparing use of nitrogen, and the planting of the rye following potatoes or some other root crop. The widely grown Petkus variety is equally susceptible to *C. graminicola* with other cultivated types, whereas the local forms, though liable to infection, rapidly recover from its effects [cf. *R.A.M.*, xv, p. 644]. Among meadow grasses soft grass [*Holcus lanatus*] suffers particularly heavy damage from snow mould. Seed-grain disinfection is essential, and it is also advisable to break up and accelerate the thawing of the snow cover by harrowing and strewing over the ground a warmth-promoting fertilizer, e.g., potash salt, calcium cyanamide, or basic slag [ibid., xv, p. 434].

Cook (M. T.). **Phloem necrosis in the stripe disease of Corn.**—*J. Agric. P.R.*, xx, 3, pp. 685–688, 2 pl., 1936.

Examination of maize affected with white stripe disease [*R.A.M.*, xiv, p. 93 and below, p. 114] in Porto Rico showed phloem necrosis to be invariably present, accompanied by a thickening of the walls of the epidermal cells, fibrous cells, and sheath. The chloroplasts in the cells of healthy plants were larger than those in the chlorotic parts of affected plants and in severely affected regions the nuclei showed disintegration.

Reed (H. S.) & Parker (E. R.). **Specific effects of zinc applications on leaves and twigs of Orange trees affected with mottle-leaf.**—*J. agric. Res.*, liii, 5, pp. 395–398, 1 fig., 1936.

In an experiment near Riverside, California, Valencia orange trees severely affected with mottle leaf [*R.A.M.*, xv, p. 714] were sprayed in 1934, shortly before the appearance of the first cycle of growth, with zinc sulphate and hydrated lime (10–5–100), and another batch was similarly treated in October. The first trees began to improve in a few weeks and the second lot showed normal growth in the following spring. As illustrating the effects of the zinc spray, it is stated that the mean areas of the small leaves of the cycle of growth immediately preceding the treatment were 0·74 and 0·75 sq. in. for the untreated and the sprayed trees, respectively; whereas the corresponding measurements for leaves formed in late summer or autumn were 1·61 and 3·67 sq. in. Other effects observed were the longer internodes and thicker xylem cylinder in the twigs from the sprayed trees.

Haas (A. R. C.). **Zinc relation in mottle-leaf of Citrus.**—*Bot. Gaz.*, xcviii, 1, pp. 65–86, 7 figs., 1936.

When healthy and mottled Valencia orange leaves [see preceding abstract] were dipped in a mixture of zinc sulphate (100 gm.), calcium

hydrate (50 gm.) and blood albumin spreader (tr.) in 1 l. distilled water and grown in rooting chambers with other undipped leaves, 28 per cent. of the healthy, treated leaves and 20 per cent. of the healthy controls rooted. Thirty per cent. of the mottled, treated leaves rooted as against only 6 per cent. in the controls. The average fresh weights of the root systems of the mottled orange leaves, treated and untreated, were greater than those of corresponding healthy leaves. Of healthy lemon leaf cuttings dipped in the mixture 52 per cent. rooted, compared with 26 per cent. for the untreated. The zinc treatment did not benefit, however, mottled lemon leaves which rooted at least as readily as the healthy ones. The leaves of mottled Valencia leafy twig cuttings had a smaller fresh weight, but produced a heavier root system than the leaves of healthy cuttings, and treatment of the mottled cuttings increased the weight of fresh roots per gram of fresh leaves. The untreated, rooted mottled orange leafy twig cuttings contained greater percentages of sucrose than the corresponding parts of healthy cuttings; the zinc treatment reduced the sucrose percentages present in the leaves and roots at the end of the experiment. The dry matter of mottled orange leaves grown in the field contained slightly greater percentages of reducing and total sugars than that of healthy leaves, and this increased sugar assists recovery when the limiting condition is corrected. The evidence obtained showed that the variations frequently observed in the rate of response to zinc treatment may be due partly to its temporarily retarding effect on growth.

Mottle leaf was produced in Valencia rooted leafy-twig cuttings grown in culture solutions lacking zinc. When the zinc concentration of the culture solution was high the addition of aluminium improved growth. In sand or soil cultures an excess of urea induced chlorosis and little leaf, the severity being regulated by the amount and frequency of the applications.

Bouhelier (R.) & Berger (G.). **Essais et observations sur l'oléocellosis des Agrumes.** [Experiments and observations on Citrus oleocellosis.] —*Rev. maroc. Fruits Primeurs*, vi, 6, p. 209–211, 2 figs., 1936.

Citrus fruits in Morocco commonly show very irregular, superficial lesions, and a spotting closely resembling oleocellosis [*R.A.M.*, xiv, p. 755]. In experiments on the latter condition commercial orange oil was dropped on to green oranges attached to the tree, and left on indefinitely or wiped off after varying periods. In all cases, a spot rapidly appeared where the drop fell, distinctness increasing with the duration of contact. Spotting also developed on ripe oranges where oil had been dropped 24 hours after picking and left in contact for 15 minutes or more. Lemons again showed similar results. Pricking the fruit (green and ripe) with a fine needle liberated the oil and led to the formation of spots. It is concluded that essential oil is the chief, if not the only, cause of the spotting.

Bitancourt (A. A.) & Jenkins (Anna E.). **Perfect stage of the Sweet Orange fruit scab fungus.**—*Mycologia*, xxviii, 5, pp. 489–492, 1 pl., 1 fig., 1936.

The authors state that the perfect stage of the sweet orange fruit

scab fungus (*Sphaceloma fawcettii viscosa*) [*R.A.M.*, xv, p. 362] was found in 1936 on a fruit of the Bahia Navel orange (*Citrus sinensis*) from San Paulo. Ascomata in all stages of development were present on a limited number of lesions; they were globose or nearly so, in contrast to the more scanty, flattened ascomata of *Elsinoe fawcetti* [ibid., xv, p. 575], occasionally confluent, buff, 40 to 120 μ [100 μ in the Latin description] in diameter, with a well-developed hyaline or slightly yellowish pseudoparenchyma devoid of a well-defined epithecium. The asci are globose to obclavate, with the inner wall thickened apically, and 15 to 27 by 13 to 21 μ; the ascospores are hyaline, variable, straight or more or less curved, 2- to 4-celled, often markedly constricted not only at the median septum but also at the other two, sometimes with a longitudinal septum in the upper middle cell, which is frequently slightly larger than the other cells; they are larger (12 to 20 by 4 to 8 μ) than those of *E. fawcetti*. The morphological differences indicated are believed to warrant the separation of the variety *viscosa* from *E. fawcetti* and its erection into a distinct species, for which the name *E. australis* n.sp. is suggested. The conidial stage is correspondingly renamed *S. australis* Bitancourt & Jenkins.

Patel (J. S.) & Nayar (A. P. B.). **Natural and induced resistance to shoot-rot in the Coconut.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 432–437, 1936.

Observations made from 1925 to 1934 on 26 coco-nut varieties from different parts of the world grown at Pilicode Research Station, Madras, showed that none was immune from the shoot rot disease attributed by Sundararaman to *Gloeosporium* sp. [*R.A.M.*, ix, p. 88]; the percentage of infection ranged from 37 in a variety from the Philippines up to 87 in one from Mysore. Trees from 3 to 9 years old were most susceptible, and susceptibility was more pronounced in trees planted on the surface of the soil than in those planted at a depth of 3 ft. Resistance was increased considerably by soil applications of potassium sulphate and slightly by liming.

Celino (M. S.). **Diseases of Cotton in the Philippines: I. Sclerotium stem rot, with notes on other diseases.**—*Philipp. Agric.*, xxv, 4, pp. 302–320, 6 figs., 1936.

In 1935 cotton growing in the Philippine Islands was attacked by *Sclerotium rolfsii* [*R.A.M.*, xi, p. 298; xiv, pp. 125, 223], locally a new record on this host. Infection usually occurred on the stem, at or just below ground-level, and the bark in the affected part turned reddish-brown, shrank slightly, and decayed. The rot developed round the stem and passed upwards to a distance of a few centimetres, and in severe cases infection might reach the woody part of the stem. The death of the plant at the base was followed by wilting of the leaves, the stem sometimes snapping. Seedlings and young plants were specially susceptible.

Inoculations of the uninjured stems of cotton seedlings and cotton seeds gave positive results under damp conditions, some of the former plants recovering, recovery being hastened by exposure to sunlight. Infection was rare when mature plants were inoculated. Cross-inocula-

tions showed that the cotton strain also attacked *Musa textilis*, egg-plant, lettuce, groundnut, soy-bean, tomato, and rice, while strains from the five first-named infected cotton. In cultures aversion was strongly manifested between the cotton organism and strains of *S. rolfsii* from other hosts, though the cotton and soy-bean strains appeared to be the same.

The disease was greatly reduced by soil sterilization. The most practical method of control consists in the prompt removal and burning of all affected parts and the soil in their immediate vicinity. If the attack is severe the plants should be sprayed with a fungicide.

Among other diseases of cotton observed was a dry rot of the flowers and bolls constantly associated with a *Fusarium*. A seedling stem rot was associated with *F. moniliforme* [*Gibberella moniliformis*], *F. solani* var. *eumartii*, and a *Rhizoctonia*. Anthracnose [*Glomerella gossypii*: ibid., xiv, p. 755] attacked all varieties at the Agricultural College. *Schizophyllum commune* [see below, p. 106] was found on cotton bolls which become hard or mummified, and areolate mildew (*Ramularia* [*Mycosphaerella*] *areola* [ibid., xi, p. 512]) was recorded for the first time from the Philippines.

Vasudeva (R. S.). **Studies on the root disease of Cotton in the Punjab. II. Some studies in the physiology of the causal fungi.**—*Indian J. agric. Sci.*, vi, 4, pp. 904–916, 2 graphs, 1936.

Further studies on the cotton root rot caused in the Punjab mainly by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [*R.A.M.*, xv, p. 148] showed that both fungi grew best in culture on a synthetic agar (containing glucose, peptone, and inorganic salts) the composition of which was based on chemical analysis of the cotton roots themselves. Both grew fairly rapidly, optimum growth occurring at 30° C.; above this, the growth rate fell, ceasing at 40° on all media except Brown's agar, on which *M. phaseoli* showed slight growth at this temperature. When grown on similar synthetic solutions each lacking in one constituent, the omission of magnesium and sodium salts had little effect on either fungus, whereas in the absence of iron salts growth was improved. The omission of phosphate or sugar reduced the vigour of growth, and in the absence of peptone, growth was reduced to a minimum, taking the form of a thin, scanty film. Both fungi tended to change the reaction of the medium, and in all cases reduced the acidity of the solutions. Both tolerated a wide range of acidity and alkalinity (P_H 2·4 to 9·2), making fairly good growth between P_H 3·2 and 8·5, with the optimum near neutrality. When grown on Richards's agar in a carbon dioxide concentration of 25 per cent., both showed marked reduction of growth. *C. solani* failed to grow when exposed to a temperature of 60° for 5 seconds, but an exposure of 5 seconds to 68° was required to kill *M. phaseoli*; both withstood a temperature of 0°.

Experimental evidence showed that the parasitic activity of *C. solani* was enhanced when it acted in combination with other fungi associated with the root disease (*Fusarium solani*, two other strains of *Fusarium*, and *Helminthosporium* sp.), whereas when *M. phaseoli* was used in combination with species of *Fusarium*, *Helminthosporium*, and *Alternaria* no significant difference in parasitic activity resulted. Mixed

inoculations with *C. solani* and *M. phaseoli* tended to increase the virulence of each.

AMBEGAOKAR (K. N.) & WAD (Y. D.). **Studies in disease resistance. I. Cotton wilt and environment.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 502–526, 1 col. pl., 2 graphs, 1936.

A study of the behaviour of *Fusarium* [*vasinfectum*] causing cotton wilt in India [*R.A.M.*, xv, p. 799] under controlled laboratory conditions and in the field showed that actual wilting was not due to insufficient soil moisture. The root death rate of wilted plants always exceeded the fresh production of active roots in the upper 18 in. of soil and this reduced root activity was reflected in reduced yields. Incidence was affected by changes in nutrient, but this influence was modified by soil conditions and varietal requirements. Though nitrogenous manures sometimes appeared to increase incidence, the leaves of wilted plants always contained less nitrogen than healthy ones. In general, potash deficiency of the leaves in relation to lime was associated with wilt, while the susceptible Malvi also showed a deficiency of magnesia. The apparent association of an abrupt increase in sunlight duration with increased incidence may be connected with low nitrogen content, sudden increase in photosynthesis producing exhaustion of the vital proteins.

THADANI (K. I.). **Some notes of the incidence of disease and resistance to pathological and other adverse conditions in crops of Sind.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 470–480, 1936.

In the course of plant breeding work at Sind it was observed that most of the imported American cotton varieties possessing leathery, glabrous leaves are susceptible to red leaf [*R.A.M.*, xv, p. 717], but strains 289 F-1 and 4 F-98 derived from Sind American cotton varieties are very resistant. The Egyptian and Sea Island cotton varieties tested in Sind show 'leaf crinkle', but three improved strains, viz., Ashmouni 37, Boss III-16, and Sea Island 2-4 have been produced, and can be grown successfully in Lower Sind.

In 1932–3, two late-maturing sorghum varieties, Bagdar No. 1 and Saoro Kartubo No. 1, were badly affected by long smut (*Tolyposporium filiferum*) [*T. ehrenbergii*: ibid., xiii, p. 300] in plots sown on 30th June, but were comparatively unaffected in plots sown between 7th and 12th June. All the varieties that flowered before the third week of August appeared to be unaffected. Similar observations were again made a year later.

Rice brown spot (*Helminthosporium oryzae*) [*Leptosphaeria salvinii*: ibid., xv, p. 740] was most severe in Sind on late varieties, in low-lying, shady areas, and under humid conditions with low temperatures. Promising results in control were given by the development of resistant varieties.

RAO (I. M.) & WAD (Y. D.). **Studies in disease resistance. II. Leaf-roll and red leaf of American Cottons.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 535–551, 2 col. pl., 2 figs., 1936.

Pot culture experiments [which are described] indicated that the 'leaf roll and red leaf' disease of American cotton varieties [see preceding

abstract] may develop if the soil surface becomes puddled after prolonged saturation. The disease could invariably be produced by deflocculation of even an inch of surface soil, either by chemical or mechanical means. The death rate of the roots of diseased plants was abnormally high and this led to disturbance of the growth balance, as shown by the lower sap concentration and nitrogen content of diseased leaves. The disease has been prevented by applications of farmyard manure or compost and in pot cultures soils treated with nitrogen yielded plants free from disease. The authors conclude that the deciding factor favouring the disease appeared to be soil deterioration during the crop season and state that appropriate treatment of the soil promises to overcome the malady.

PRINDLE (B.). **Microbiology of textile fibres. V. Method for the general histological examination of normal or mildewed Cotton fibres.** - *Text. Research*, vi, 11, pp. 481–487, 8 figs., 1936.

Details are given of a method for the detection and observation of changes in the histological structure of cotton fibres in the course of mildew development [cf. *R.A.M.*, xv, p. 18]. The fibre elements are first stained in a 0·15 per cent. solution of Victoria Blue B, boiled for one minute, washed in cold water, boiled in fresh distilled, again rinsed in cold, and finally subjected to swelling in a cuprammonium solution containing not more than 0·8 per cent. copper. The normal fibres will then be found to present a beaded appearance due to bulging of the swollen cellulose of the secondary wall between constricting collars of resistant cuticle, whereas the mildewed elements swell more readily and evenly. The outstanding advantage of this technique, however, consists in the ease with which the state of the material in the lumen of the fibres and the cuticle may be observed.

RENNERFELT (E.). **Untersuchungen über die Entwicklung und Biologie des Krebspestpilzes Aphanomyces astaci, Schikora.** [Studies on the development and biology of the Crab fungus, *Aphanomyces astaci* Schikora.]—*Medd. Undersökn. o. Försöksanst. Söttvattensfisk.*, *Stockh.*, 10, 21 pp., 2 figs., 1936. [Swedish summary.]

Aphanomyces astaci, the agent of a severe parasitic disease of freshwater crabs (*Astacus fluviatilis*) in Sweden, was isolated from the ventral chain of ganglia of infected individuals and grown in pure culture on blood (crab, fish, and animal) agar. It is characterized by a branched mycelium, 7·5 to 9·5 μ in diameter, undifferentiated zoosporangia of the same dimensions, zoospores 8·1 to 9·5 μ in diameter, forming a group at the top of the empty sporangium, each giving rise to an elliptical, biciliate swarm spore, globular, echinulate oogonia, 41·6 to 48 μ in diameter, borne terminally on short branches, oospores 22·4 to 28·8 μ in diameter, and occasional androgynous antheridia. The strongly parasitic tendency of *Aphanomyces astaci* was shown in these experiments by its inability to grow on vegetable substrata.

The optimum temperature for the development of *A. astaci* was found to be about 20° C., but good growth takes place throughout the range from 10° to 25°; the minimum is below 5° and the maximum round about 30°; the mycelium of the fungus was killed by twelve

hours' freezing. These relationships explain the virulent character of the summer epidemics of the disease. An acid reaction is more favourable to the development of *A. astaci* than an alkaline one, especially as regards zoospore production, which declined to a minimum at P_H 8·4 and above.

At concentrations of 0·001 per cent., copper sulphate and mercuric chloride inhibit mycelial development in the crab fungus, to which chlorine (7·5 mg. per l.) is also highly toxic. The mycelium does not survive desiccation, but the results of experiments on its viability under different conditions suggest that it may well be carried from lake to lake on nets or other tackle to which fish blood, glue, or any organic substance adheres.

Negroni (P.). **Étude de la capsule de Mycotorula albicans (Ch. Robin, 1853).** [A study of the capsule of *Mycotorula albicans* (Ch. Robin, 1853).]—*Ann. Parasit. hum. comp.*, xiv, 5, pp. 511–516, 1936.

An account of this study on the capsule of *Mycotorula* [*Candida*] *albicans* has already been noticed from another source [*R.A.M.*, xv, p. 221].

Hopkins (E. W.) & Hesseltine (H. C.). **Reliability of fermentation tests in identification of the Monilias.**—*J. Lab. clin. Med.*, xxi, 11, pp. 1105–1113, 1936.

Eleven strains of *Monilia* isolated from cases of vulvovaginitis and oral thrush [*R.A.M.*, xii, p. 370] retained the same fermentation characters for periods of six to eight months after isolation. In some instances a large amount of inoculum induced fermentation when a small one failed to do so. A comparison of the fermentation data for the three types recognized by Stovall and Bubolz [ibid., xii, p. 691; xiv, p. 34] (*M.* [*Candida*] *parapsilosis*, *M.* [*C.*] *albicans*, and *M. candida* [*C. vulgaris*]) revealed considerable unanimity. In general, the fermentation rates of *Monilia* differ sufficiently to permit separation into groups. Morphological studies are indicated in the case of occasional strains giving variable fermentation reactions.

Martin (D. S.), Baker (R. D.), & Conant (N. F.). **A case of verrucous dermatitis caused by Hormodendrum pedrosoi (chromoblastomycosis) in North Carolina.**—*Amer. J. trop. Med.*, xvi, 5, pp. 593–619, 5 pl., 1936.

From a case of verrucose dermatitis (chromoblastomycosis) affecting the left hand and arm of a negro the authors isolated *Hormodendrum pedrosoi* [*R.A.M.*, xvi, p. 38], the first record of the fungus in the United States. Several types of conidial formation were observed in cultures. A *Hormodendrum* type was present, with spores, 3 to 6 by 1·5 to 3 μ, connected into branching chains by 'disjunctors' [pads], 0·5 μ thick, which remained attached to the spores after the chain was broken. *Acrotheca*-like spore heads also occurred. Tooth-like processes appeared on the apical portion of the terminal cell of some of the conidiophores, and as spores developed terminally on these structures, other similar processes were formed pleurogenously. *Acrotheca*-like spore heads also developed on typical *Hormodendrum* conidiophores. The *Phialophora*

type of reproduction described by Carrión and Emmons [loc. cit.] in cultures of *H. pedrosoi* was also noted. Clusters of ovoid spores 1·5 to 2 by 0·5 to 1 μ were borne in cups on flask-shaped conidiophores which appeared singly (or in groups of two or more) along the hyphae or terminally. All three types occurred in single-spore cultures.

Martin (D. S.) & Smith (D. T.). **The laboratory diagnosis of blastomycosis.**—*J. Lab. clin. Med.*, xxi, 12, pp. 1289–1296, 4 figs., 1936.

The laboratory procedures of value in the diagnosis of blastomycosis (*Blastomyces* [*Endomyces*] *dermatitidis*) [*R.A.M.*, xv, p. 722] are described in detail and include the examination of sputum, isolation of the fungus on blood agar or Sabouraud's dextrose agar, purification of isolations by transfers of aerial hyphae clipped off by scissors, and complement-fixation tests.

Ivanić (M.). **Über den Bläschenkernbau und die promitotische Kernteilung eines im menschlichen Enddarme lebenden Pilzes (Blastocystis hominis Brumpt).** [On the vesicular nuclear structure and the promitotic nuclear division of a fungus occupying the human rectum (*Blastocystis hominis* Brumpt).]—*Arch. Protistenk.*, lxxxvii, 2, pp. 242–247, 14 figs., 1936.

The author has followed cytologically the stages of development of *Blastocystis hominis* [*R.A.M.*, xv, p. 94], an extremely widespread occupant of the human rectum in Bulgaria, and here presents in detail the results of his observations.

Hruszek (H.). **Sur l'irréversibilité du pléomorphisme des dermatophytes (inoculation chez l'homme).** [On the irreversibility of pleomorphism in dermatophytes (inoculation into man).]—*Ann. Parasit. hum. comp.*, xiv, 5, pp. 517–518, 1936.

Squamae produced on the author's skin after inoculation with a pleomorphic culture of *Achorion gypseum* [*R.A.M.*, xv, p. 651] several months old were seen to contain a few short, non-septate hyphae but no spores, and on re-isolation yielded a purely pleomorphic culture of the same fungus. This fact is considered to militate in favour of the view of the stability and irreversibility of downy degeneration in ringworm fungi.

Kittredge (H. E.). **Onychomycosis universalis trichophytina et epidermophyta : report of the seventh case thus far recorded in English.** —*Arch. Derm. Syph., Chicago*, xxxiv, 3, pp. 398–410, 2 figs., 1936.

In connexion with the report of a case of onychomycosis universalis, the agent of which was tentatively identified by Weidman as *Trichophyton purpureum* [*R.A.M.*, xv, p. 500], the author reviews the previous six instances and critically discusses the available information as to the rôle of certain habitual saprophytes in the etiology of the condition.

Suzuki (S.). **Über Trichophytie und ihre Erreger auf der Miura-Halbinsel, und ein Beitrag zur Kenntnis der Achorion gypseum Bodin (1907).** [On trichophytosis and its agents on the Miura peninsula, and a contribution to the knowledge of *Achorion gypseum* Bodin (1907).]—*Jap. J. Derm. Urol.*, xl, 2, pp. 86–87, 1936.

One hundred cases of trichophytosis, yielding 31 fungal cultures, were

detected in the course of an inspection of five national schools and a factory on the Miura peninsula, Japan, the following organisms being involved: *Trichophyton violaceum* (3), *T. glabrum* (1), *T. purpureum* (12) [see preceding abstract], *T. interdigitale* (10), *T. gypseum asteroides* [*T. mentagrophytes*] (1), and *Achorion gypseum* (4). Particular interest is attached to the last-named [*R.A.M.*, xv, pp. 501, 651], isolated from three children and one adult; it grew rapidly on Sabouraud's medium, forming a dry, white, flocculent colony with a circular, pulverulent, rusty-brown zone round the central umbo, and bearing a profusion of plurilocular (mostly 5 to 6) spindles. Positive results were obtained in inoculation experiments on guinea-pigs and hens, while the fungus also penetrated the leaf tissues of *Rohdea japonica*.

Dósa (A.). **Mikrosporon felineum und Mikrosporon fulvum an Hand von 'Herpes tonsurans erythematosquamosus'- bzw. 'Herpes tonsurans'-Fällen.** [*Microsporon felineum* and *Microsporon fulvum* in association, respectively, with cases of herpes tonsurans erythematosquamosus and herpes tonsurans.]—*Derm. Wschr.*, ciii, 38, pp. 1281–1284, 4 figs., 1936.

The differences between *Microsporon felineum* and *M. fulvum* [*R.A.M.* xv, p. 440], the former isolated from a case of herpes tonsurans erythematosquamosus in a 25-year-old woman and the latter from herpes tonsurans in a nine-year-old child at Szeged, Hungary, are considered insufficient to warrant the separation of these two species, which the author proposes to unite under the name of '*M. felineofulvum*'.

Riddet (W.) & Neill (J. C.). **Butter-boxes and mould-growth.**—*N.Z. J. Agric.*, liii, 3, pp. 129–139, 7 figs., 1936.

Experiments carried out in New Zealand showed that moulds (*Pullularia pullulans*, *Cladosporium herbarum*, *Penicillium expansum*, *Mucor* sp., and a red-staining type) originating in butter boxes may infect the surface layer of butter packed therein, and cause extensive damage [*R.A.M.*, xiv, p. 762]. Mould growth on the boxes was stimulated by defrosting the butter at high atmospheric temperature in air of high humidity, by admitting air to the inner surface of the box, and by the use of sap wood in place of heart wood and of rotary-cut instead of sawn timber. Standard, $\frac{3}{8}$ in. sawn saranac (wire-bound), sub-standard, and $\frac{1}{4}$ in. sawn saranac boxes made of white pine [*Podocarpus dacrydioides*] did not readily develop moulds, but were increasingly susceptible in the order given. The 'springing' of the sides away from the ends of saranac boxes during handling and the consequent admission of air stimulated mould growth. Swedish pine impregnated with wax was less susceptible than white pine, but imparted a taint to the butter. Immersion of the timber in 0·1 per cent. sodium salicylanilide (Shirlan W.S.) solution for 10 minutes gave very promising results in preventing infection. Aluminium foil between two sheets of parchment paper besides other advantages successfully prevented moulds from reaching the butter from the inner surfaces of the boxes. It is concluded that the $\frac{3}{8}$ in. sawn saranac container is probably the best type for export purposes, provided the sides are securely attached to the ends.

Molenaar (F. A. P.). **Magnesium in verband met ziekteverschijnselen bij cultuurgewassen.** [Magnesium in relation to pathological symptoms in cultivated plants.]—*Landbouwk. Tijdschr., Wageningen*, xlviii, 590, pp. 637–638, 1936.

In 1931 the writer applied to some abacá (*Musa textilis*) plants in Sumatra showing symptoms somewhat resembling those of bunchy top in the Philippines [*R.A.M.*, xiv, p. 37] ½ to 1 kg. magnesium sulphate per stool (equivalent to between 500 and 1,000 kg. per hect.), which resulted in a marked improvement within a month, the leaves resuming their normal dark green colour and gradually starting to make vigorous growth. The disorder is thought to have been due to magnesium deficiency, a common trouble in soils with an inadequate lime supply, such as the old liparite-tufas on which these abacá stands were planted.

Tilford (P. E.). **Fasciation of Sweet Peas caused by Phytomonas fascians n.sp.**—*J. agric. Res.*, liii, 5, pp. 383–394, 2 figs., 1936.

An amplified account is given of the writer's investigations on fasciation of winter-flowering sweet peas in Ohio [*R.A.M.*, xiv, p. 365; xv, p. 723]. The disorder is caused by a hitherto undescribed bacterium which is named *Phytomonas fascians* n.sp. It is a non-motile, aerobic, non-sporulating, Gram-positive, non-acid-fast rod, 1·5 to 4 μ long by 0·5 to 0·9 μ in diameter (average 2·7 by 0·69 μ). It has no diastatic action, does not liquefy gelatine, reduces litmus in the bottom of the tubes, produces hydrogen sulphide and ammonia, reduces nitrates, and does not form indol. On potato dextrose agar it forms cadmium yellow to deep chrome or orange-buff colonies, and in broth produces a slight turbidity with sediment and a thin, fragile pellicle with a rim on the surface. It grows at temperatures from 7° to 35° C., with an optimum between 25° and 28°; thermal death point between 55° and 57° with 10 minutes' exposure. It retained its virulence in potato dextrose agar culture for over 18 months.

The bacterium was experimentally shown to be pathogenic to all the varieties of sweet peas tested, and to garden peas, petunias [*Petunia hybrida*], geraniums [*Pelargonium*], tobacco, and *Gypsophila paniculata* plants. It has also been isolated from fasciated growths on a chrysanthemum received from New Jersey.

Ware (W. M.). **Alternaria leaf-spot of Stock (Matthiola).**—*Gdnrs' Chron.*, c, 2596, pp. 236–237, 3 figs., 1936.

An account is given of a disease affecting the foliage of Ten-week and Early-flowering Harbinger stocks (*Matthiola*) [*incana* var. *annua*] in a greenhouse at Ashford, Kent, in 1935. The symptoms, which were confined to the lower leaves, consisted of pale greyish-green, slightly depressed, dry lesions, 3 to 10 mm. in diameter, and a marked tendency to collapse due to lack of rigidity of the mid-rib. Many leaves also bore dark brown to nearly black, concentric spots, on which were produced an abundance of concatenate, 2- to 14-septate, greyish-green conidia, 30 to 140 by 12 to 24 μ (average 86 by 18 μ), frequently showing a scar, 2 to 3 μ in length, at either extremity marking the place of attachment to the conidiophore (50 to 140 by 3 to 6 μ) or to the next spore in the

chain. The fungus was tentatively identified by S. P. Wiltshire with a parasite of *Brassica chinensis* and other crucifers in Japan recorded by Yoshii as *Alternaria brassicae* (Berk.) Sacc. var. *macrospora* Sacc. [*R.A.M.*, xiii, p. 3] but for which there does not appear to be a legitimate name. The origin of the disease, which is new to Great Britain, is unknown. The removal of the infected leaves was partially successful in controlling the disease.

Harris (M. R.). **A Coniothyrium disease of Peonies.**—*Plant Dis. Reptr*, xx, 15, pp. 236–238, 1936. [Mimeographed.]

A rapid wilting and killing of the flower stems of tree peonies (*Paeonia mootan*) as a result of basal girdling of the stem by *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xvi, p. 47] is recorded from the San Francisco Bay region, Sacramento and Santa Clara, California. Inoculations through wounds or by spraying the growing tips with a spore suspension gave positive results on *P. mootan* and *P. albiflora* (not a natural host). Control measures based on plant sanitation methods and spraying with 3–3–50 Bordeaux mixture are recommended.

Lambert (E. B.) & Crandall (B. S.). **A seedling wilt of Black Locust caused by Phytophthora parasitica.**—*J. agric. Res.*, liii, 6, pp. 467–476, 3 figs., 1936.

An account is given of a serious wilt of black locust (*Robinia pseudacacia*) seedlings, which was first noticed in 1933 in a nursery of Virginia, and which has since been found also to occur in a few nurseries in North Carolina and Alabama. Isolations from diseased material yielded a typical strain of *Phytophthora parasitica* (as identified by C. M. Tucker), the pathogenicity of which to black locust seedlings was experimentally demonstrated. The most severe damage in the nurseries was done to seedlings one to three weeks old, the first noticeable symptom being a slight drooping or curling of the cotyledons, followed by the sudden wilting and collapse of the entire upper portion of the seedling, which often completely disintegrates in four to five days. Seedlings over four weeks old occasionally may exhibit a very similar wilting, but the disease is then clearly not systemic and is rarely fatal. Experimentally the disease was induced in healthy seedlings by spraying them with swarm spores of the fungus, and also by inoculating the soil with cultures. There was also evidence that the liberation of swarm spores, encystment, germination, and penetration of the host tissues all take place in four hours under favourable environmental conditions. In the greenhouse and in field plots the wilt was controlled by acidifying the soil to a P_H value of 4·6 or by spraying the seedlings with 4–6–50 Bordeaux mixture.

Weimer (J. L.). **Alfalfa dwarf, a virus disease transmissible by grafting.**—*J. agric. Res.*, liii, 5, pp. 333–347, 3 figs., 1936.

The results of the work reported in this paper showed that the dwarf disease of lucerne [*R.A.M.*, xiii, p. 241] is neither due to unfavourable soil conditions, nor to a fungus; numerous bacteria were isolated from at least 75 per cent. of the diseased roots studied, but none proved to be pathogenic to lucerne. Soil did not appear to carry the causal agent in

itself, but in some experiments infection appeared to spread from pieces of diseased roots placed in the soil though not from pieces of diseased stems. The disease spreads readily from affected to adjacent healthy plants, and water, not an important factor in dissemination of the causal agent, may yet play a part in transporting living root tissue or possibly in carrying an insect vector. Stem cuttings from diseased plants produced from 35 to 80 per cent. of dwarfed plants. The disease was not transmitted by the leaf or needle inoculation of diseased sap, or by inserting bits of diseased tissue into healthy plants, except when yellow wood of the root or crown was used, and even then the percentage of infection was very small (except in one case in which 84 per cent. infection was obtained). A high percentage of infection was, however, obtained by successful approach grafting of a diseased root on a healthy one, or *vice versa*. These data indicate that lucerne dwarf is a virus disease transmissible by grafting but not by juice inoculation.

Wiant (J. S.) & Starr (G. H.). **Field studies on the bacterial wilt of Alfalfa.** *Bull. Wyo. agric. Exp. Sta.* 214, 20 pp., 4 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, pp. 501, 1936.]

Most of the reductions in the lucerne yield in Wyoming have been found to be due to a gradual depletion of the stands by the widespread *Phytomonas insidiosa* [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 602; xv, p. 559]. No correlation has been observed between bacterial wilt and either available soil phosphorus or soluble salts, but a rise in the incidence of the disease is constantly associated with higher percentages of plants suffering from winter injury. The cultivation of resistant varieties seems to be the sole practicable control measure.

Yarwood (C. E.). **The tolerance of Erysiphe polygoni and certain other powdery mildews to low humidity.**—*Phytopathology*, xxvi, 9, pp. 845–859, 1936.

At favourable temperatures conidia of *Erysiphe polygoni* from red clover [*Trifolium pratense*: *R.A.M.*, xv, p. 659] and bean [*Phaseolus vulgaris*: ibid., xiv, p. 207] germinated well at relative humidities from 100 down to approximately 0 per cent., but both germinated and non-germinated spores were soon shrivelled and killed at the lower values. The adverse effects of low humidity were increased at high temperatures.

Conidia of *E. polygoni* and those of *E. graminis* from barley [ibid., xv, p. 568] retained their turgidity at 80 per cent. relative humidity, though decreasing considerably more in volume than those kept at 100 per cent. or floating on water during germination. On the other hand, conidia of *Colletotrichum trifolii* [ibid., xiii, p. 773], *Sclerotinia fructicola*, and *Cicinnobolus cesatii* [ibid., xiii, p. 774] did not germinate without free water and increased greatly in volume during the process.

The clover mildew mycelium made good growth at 100 per cent. relative humidity and temperatures up to 27° C. but at 0 per cent. relative humidity growth was rather less and in two tests none at all occurred at 25° and 27°. Infection with the powdery mildews of clover, bean, cabbage [ibid., xv, p. 659], *Delphinium* [ibid., xiii, p. 460], mustard [all *E. polygoni*], barley (*E. graminis*), and cantaloupe (*E.*

cichoracearum) [ibid., xiii, p. 286; xvi, p. 13] was successful at the lowest relative humidities tested (25 to 55 per cent.).

Conidiophores of bean and mustard mildew were destroyed by heavy rain, and conidial dissemination was severely checked by rain in both these organisms, as well as in clover mildew, while the pea mildew [also *E. polygoni*: ibid., xiv, p. 287], as well as that of beans, was injured or killed by atomizing the diseased foliage with water.

SAHAYA (C. B.). **A disease of Cyperus tegetiformis Roxb. caused by Kawakamia cyperi (Miyabe and Ideta) Miyabe.**—*Indian J. agric. Sci.*, vi, 4, pp. 992–993, 1 pl., 1936.

Cyperus tegetiformis Roxb., used in Bihar as a fodder, has for some years past shown a diseased condition of the twigs and leaves during the rainy season, the affected culms being bright yellow, later reddish-brown, and finally wilting. Diseased material showed the presence of a non-septate mycelium, and conidia 30 to 70 by 20 to 35 μ, with a prominent, brittle beak 3 to 15 μ long, sometimes attached, and a persistent pedicel. The fungus is identified as *Kawakamia cyperi* (Miyabe and Ideta) Miyabe. It is stated that H. M. Fitzpatrick considers this genus inseparable from *Phytophthora*.

WOLLENWEBER (H. W.) & HOCHAPFEL (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. I. Phomopsis, Dendrophoma, Phoma und Ascochyta und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. I. *Phomopsis*, *Dendrophoma*, *Phoma*, and *Ascochyta*, and their relationship to fruit-rotting.]—*Z. Parasitenk.*, viii, 5, pp. 561–605, 20 figs., 1936.

In this, the first paper of a series dealing with imperfect fungi isolated by the authors during the last ten years from lesions on different host plants and timbers, descriptions are given of 20 species of *Phomopsis*, *Dendrophoma*, *Phoma*, and *Ascochyta*, with particular reference to those that were found causing rots of dessert fruits and cucurbits in the Berlin markets or were shown to be able to attack them. A dichotomous key to these species is appended.

Phoma enteroleuca [*R.A.M.*, viii, p. 754], which is renamed *Phomopsis enteroleuca* n.comb., was isolated from a rotting pear, and was shown to be pathogenic to this host. Morphologically indistinguishable strains of *P. ambigua*, the pycnidial stage of *Diaporthe ambigua* [ibid., xiii, p. 525], were isolated from rotting apples, quinces, discoloured wood of elm and yew (*Taxus baccata*), and dying twigs of walnut (*Juglans regia*), and red chestnut (*Aesculus carnea*); all the isolations were shown to cause a rot of apple, pear, and quince fruits. The fungus appears to have a life-cycle which may include one or several species of *Phoma*. *P. aceris-negundinis*, isolated from overwintered fruits of *Acer negundo* near Berlin, was able to cause a rot of apples. It differs from *P. striaeformis* in the more rounded shape and somewhat smaller size of its fructifications. *P. destructiva* [ibid., xv, p. 781] is fairly frequent on ripening tomato fruits, causing a wet rot, in the neighbourhood of Berlin, where it overwinters in dead tomato plants left in the ground.

None of the strains of the fungus tested was able to attack apples, pears, cucurbits, or carrots, but all were pathogenic to tomato fruits. The new combination *P. glomerata* is suggested instead of *Coniothyrium glomeratum*, the synonymy appended consisting of eleven other binomials, including *P. alternariaceum* [ibid., xiv, p. 761] and *P. richardiae* [ibid., i, p. 150]; it is stated to be economically important only by reason of the rot it causes to tomato fruits, since tests showed that it is not pathogenic to pome fruits or plums. *Depazea prunicola* is renamed *P. prunicola* n.comb., the synonymy appended including *Phyllosticta pirina* [ibid., xi, p. 159] and *P. prunicola* [ibid., x, p. 296]. From *Phoma glomerata* the fungus differs in the somewhat smaller size of its spores and in the larger size of its fructifications, which may be furrowed on the outside. Although it has been frequently isolated from the core of entirely sound apples, it has been shown to be incapable of attacking this fruit even when wounded. *Ascochyta* [*Didymella*] *lycopersici* [ibid., xv, p. 690] was shown to attack apples, pears, and lemons, besides tomatoes, but not plums. In nature, however, it has not been recorded on hosts other than the tomato. *A. pirina* [ibid., x, p. 296], isolated from various sources, was also shown to be pathogenic to apples, pears, and lemons. *A. pisi* [ibid., xv, pp. 273, 468, *et passim*] and its variety *foliicola* n.comb. were both proved to be pathogenic to apples, and *A. pisi* also to tomato fruits.

Birmingham (W. A.). **Wood rot and limb blight of fruit trees.**—*Agric. Gaz. N.S.W.*, xlvii, 9, pp. 507–511, 5 figs., 1936.

In New South Wales yellowish wood rot due to *Polystictus versicolor* [*R.A.M.*, vi, p. 167; xvi, p. 4] occurs on re-worked apples, pears, and plums, as well as on peaches, apricots, and citrus trees. Many trees after re-working are killed by the disease, and the vitality of others is seriously impaired. In some cases infection extends along the main limbs and well down the trunk. The author recommends that in re-working trees cuts should be cleanly made and treated with an antiseptic, the surfaces being allowed to dry thoroughly before receiving a final coat of white lead or other protective covering. In the affected districts a dormant spray of Bordeaux mixture (6–4–22) should be applied. Tools used in removing the diseased material should be sterilized in 3 per cent. formalin before use elsewhere.

Heart rot (*Schizophyllum commune*) [ibid., ii, p. 271; xiv, p. 348] severely affects numbers of re-worked apple, cherry, and plum trees, many of which succumb. In one instance, all the apple trees (not re-worked) in one locality had to be grubbed out owing to the disease, and in another area 70 per cent. of the trees were badly infected. In a third district, 100 out of 500 peach and nectarine trees were severely attacked. The disease is characterized by a blackish stain which may extend a foot or two down the bark; its appearance is followed by the production of sporophores. The bark may crack longitudinally, and ultimately cankered areas form and whole limbs die. Infection occurs through injured surfaces, and control includes the proper dressing of wounds and avoiding injury to the trees.

Pink disease (*Corticium salmonicolor*) [ibid., xiv, p. 146] has been recorded only twice in New South Wales, on 25-year-old Carrington

apple trees at Glenorie in 1934, and two Allsop apple trees at Laughtondale in 1936. It did considerable damage to the limbs of the Carrington trees. The affected branches should be removed well beyond the infected part, at the junction with the next oldest limb, and burned. All wounds and cuts should be painted with white lead or tar. Where a regular spraying programme is not carried out a dormant application of Bordeaux mixture (6–4–40) or lime-sulphur (1 in 14) should be made every year.

BIRMINGHAM (W. A.). **Jonathan spot of Apple.**—*Agric. Gaz. N.S.W.*, xlvii, 9, p. 512, 1936.

A brief, popular account is given of Jonathan spot [*R.A.M.*, xv, p. 300], recorded on ten varieties of apple in Australia, and for the control of which the author recommends harvesting promptly at the correct picking stage and in any case on the first indication of the condition, and immediate, well-aerated storage at 33° to 34° F. for a period not exceeding three or four months.

SUTHERLAND (R.). **Factors relating to the control of soft-scald in Jonathan Apples.**—*N.Z. J. Agric.*, liii, 3, pp. 161–166, 1 fig., 1936.

Cold storage experiments carried out over a period of four years in New Zealand on the causes of wastage in Jonathan apples showed that soft scald [*R.A.M.*, xv, p. 811] varies in its prevalence from season to season, but often causes serious loss. Both fungal rots and internal breakdown were seldom serious when the apples were removed from cold storage, but developed in varying amounts during ripening. Susceptibility to soft scald varies with the locality and the orchard, while clear evidence was obtained that the condition is associated with fungal rotting. Jonathan apples 14 days after removal from storage at 34° F. showed (averages for three seasons) 8, 2·5, and 1·5 per cent. soft scald, internal breakdown, and fungal rots, respectively, the corresponding figures for fruit stored at 37° being 3, 2·5, and 1·5 per cent. This indicates that soft scald may be minimized by storage or transport at a relatively high temperature. Samples stored at 34°, 37°, and 32° to 42° (the last lot in a pre-cooler in which the higher temperature generally prevailed) developed 10, 2·4, and 0 per cent. soft scald, respectively. Delaying cold storage for ten days after gathering in all cases increased the amount of soft scald that developed in samples picked in two stages of maturity, the figures being 2 and 5 per cent. soft scald for the first picking (immediate and delayed storage, respectively) and 3 and 8 per cent. for the second. Oiled wrappers did not reduce soft scald incidence. Fertilizer treatments gave inconclusive results in reducing susceptibility, which was augmented by increased rainfall at the end of the growing season.

It is concluded that fruit picked when neither overripe nor insufficiently mature is least liable to the condition. Immediate cooling after gathering is advised, with cold storage at 36° to 38°. The writer considers that the term 'soft scald' is misleading, since the condition is not related to superficial scald, but is rather a form of external breakdown.

Kadow (K. J.) & Anderson (H. W.). **Further studies on zinc sulfate in Peach sprays with limited tests in Apple sprays.**—*Bull. Ill. agric. Exp. Sta.* 424, pp. 131–144, 1936.

In this bulletin the writers sum up and discuss the results of seven years' experimental work to determine the value of zinc sulphate as an ingredient in peach and apple sprays under Illinois conditions [*R.A.M.*, xv, p. 235]. Much of the information is concerned with the value of the compound in reducing injury from lead arsenate and lime mixtures. In laboratory tests zinc sulphate proved much more toxic to apple scab (*Venturia inaequalis*) than to brown rot (*Sclerotinia fructicola*), but in the field it was only 65 per cent. effective in the control of the former disease. On the basis of these investigations, therefore, zinc sulphate cannot be recommended as a component of apple fungicides.

Cristinzio (M.). **Studio sulla ruggine delle Drupacee (Puccinia pruni-spinosae, Pers).** [A study on the rust of stone fruits (*Puccinia pruni-spinosae*, Pers).]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 15–48, 2 pl. (1 col.), 1 fig., 4 graphs, 1936.

In morphological and biological studies of *Puccinia pruni-spinosae* [*R.A.M.*, xv, p. 590; xvi, p. 47] on almond, apricot, myrobalan [*Prunus divaricata*], plum, and peach carried out at Portici, it was found that the colour, size, and distribution on the leaf surface of the uredosori and teleutosori, and the colour and size of the leaf lesions, vary with the host, as also does the shape of the paraphyses, uredospores, and teleutospores. Both the uredo- and teleuto-sori range from 100 μ in diameter on myrobalan to 1,000 μ on plum. The paraphyses show a long, thin, undulating stalk with an almost spherical apical swelling on myrobalan, a short stalk, with a depressed apical swelling on plum, a stout but rather long stalk, and a subspherical apical swelling on apricot, while on peach they are claviform, with a short, stout stalk and only a slight apical swelling. The uredospores range from 18 to 28 by 15 to 25 μ on myrobalan to 25 to 45 by 12 to 16 μ on apricot, and the teleutospores from a mean of 26 by 16 μ on myrobalan to 39 by 26 μ on apricot, with stalks varying from 13 μ long on myrobalan to 28 μ on almond. The results as a whole show that on different hosts the fungus produces special morphological entities with constant characters.

P. pruni-spinosae is mainly confined to the leaves, and in severe infections, such as occurred locally in 1934–5, premature leaf fall results, the vigour of the trees being impaired. No aecidia were found on anemone, the alternate host. Locally, the fungus overwinters by means of the uredosori on the branches, or even by means of the spores, which are very resistant to high and low temperatures. Cross-inoculations showed that no genetic variations correspond with the morphological differences on the various hosts. For control of the disease, the trees should be sprayed with a 4 per cent. copper mixture immediately after leaf fall and shortly before flowering in the spring, and again with a 1 per cent. mixture at the end of April and May.

KUNKEL (L. O.). **Heat treatments for the cure of yellows and other virus diseases of Peach.**—*Phytopathology*, xxvi, 9, pp. 809–830, 3 figs., 1 graph, 1936.

This is an expanded account of the writers' experiments in the control of peach yellows, little peach, rosette [*R.A.M.*, xvi, p. 65], and red suture [ibid., xiv, p. 298], a preliminary note on which (referring to yellows and rosette) has already been cited [ibid., xiv, p. 374]. It was found possible to cure dormant trees affected by yellows by a ten minutes' dip in a tank of water held at 50° C., while the virus was inactivated (without injury to the buds) by immersion of the bud sticks at 34° to 35° in 4 to 5 days, at 38° in 11 hours, at 42° in 40 minutes, at 46° in 15, at 48° in 14, at 50° in 3 to 4, at 54° in 1½ minutes, and at 56° in 15 seconds. Little peach and red suture proved amenable to treatments effective against yellows, but rosette was more refractory, surviving two hours' exposure to a temperature of 40° and only succumbing after 8 to 10 minutes at 50°. Once the rosette had become systemic in a tree heat treatments were unavailing, the trees dying quickly from heat injury, but cures were readily effected when the applications were made from one to three weeks after infection.

HAHN (G. G.). **Immunity of Viking Red Currant from White Pine blister rust under field conditions.**—*Phytopathology*, xxvi, 9, pp. 860–875, 2 figs., 1936.

A tabulated account is given of three years' observations (1932 to 1934) on the reaction of the Norwegian Viking red currant variety to eastern and western North American strains of *Cronartium ribicola* [*R.A.M.*, xvi, p. 74] on 28 plots in the eastern and north-western United States and Canada, natural infection being supplemented by artificial inoculations. The results fully corroborated those obtained in greenhouse trials [ibid., xiv, p. 377] in respect of the virtual immunity of Viking from blister rust. Resistance to drought was also shown by Viking. In preliminary experiments with open-pollinated seedlings of the variety propagated from Norwegian and American seed a very high percentage of immunity from blister rust was shown, indicating that this character is dominant in the parent. The possibilities of extended cultivation of Viking in blister rust-control and non-control areas are discussed.

PIERSON (R. K.). **A method of separating the teliospores of Cronartium ribicola.**—*Phytopathology*, xxvi, 9, pp. 923–925, 1 fig., 1936.

The separation of the teleutospores of *Cronartium ribicola* on *Ribes* leaves [see preceding abstract] from the matrix binding them firmly together in compact columns may be effected by immersing the material in normal nitric acid, boiling vigorously until the columns begin to become detached and bleached, adding cold water, allowing to settle, and decanting off and washing four or five times to remove the acid before mounting the columns in glycerine or glycerine jelly, the chains of spores being broken up by movement of the cover slip. The method is also applicable to *C. occidentale*.

Reypens (J. L.). **La production de la Banane au Cameroun.** [Banana production in the Cameroons.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. techn., 7, 23 pp., 19 figs., 1 map, 1936.

In this account of the banana-growing industry in the Cameroons, where the Gros Michel variety imported from Costa Rica is cultivated for export to Europe, the author states that the only diseases so far observed are isolated cases of a bacterial vascular disease and cigar-end rot [*Stachylidium theobromae*: *R.A.M.*, xv, p. 633], the latter being rather more common, but causing no serious damage.

McCallan (S. E. A.), Hartzell (A.), & Wilcoxon (F.). **Hydrogen sulphide injury to plants.**—*Contr. Boyce Thompson Inst.*, viii, 3, pp. 189–197, 3 pl., 1936.

A brief study of the action of hydrogen sulphide gas on 29 species of green plants fumigated in glass chambers out of doors during the growing season showed that young tissue was more sensitive to injury than old. The young shoots and leaves developed scorching, the next older leaves basal and marginal scorching, and the mature leaves remained unaffected. The symptoms were usually fully expressed within a few days of treatment. At concentrations below 400 p.p.m. carnation, purslane (*Portulaca oleracea*), Boston fern (*Nephrolepsis exaltata* Schott var. *bostoniensis* Davenport), apple, cherry, peach, strawberry, and *Coleus blumei* Benth. showed no appreciable injury. At concentrations from 40 to 400 p.p.m. pepper (*Capsicum frutescens*), rose, nasturtium (*Tropaeolum minus*), castor bean (*Ricinus communis*), gladiolus, sunflower, buckwheat, and cornflower (*Centaurea cyanus*) showed slight to moderate injury. Soy-bean, Turkish tobacco, aster, kidney bean (*Phaseolus vulgaris*), cucumber, *Nicotiana glauca*, *Salvia splendens*, California poppy (*Eschscholzia californica*), tomato, sweet clover (*Melilotus alba*), radish, *Coreopsis* sp., and *Cosmos* sp. showed slight injury below 40 p.p.m. and severe injury and death above 400 p.p.m. Injury increased rapidly with rise in temperature. Some wilted plants appeared less susceptible to injury than normal ones. When aster, buckwheat, sunflower, and tomato plants were sprayed with lime-sulphur 1 in 20 symptoms identical with those due to hydrogen sulphide were produced.

Reckendorfer (P.). **Über den Zerfall des Kupferkalkbrühe-Komplexes. (Ein analytischer Beitrag zur Kenntnis des 'wasserlöslichen' Kupfers.)** [On the decomposition of the Bordeaux mixture complex. (An analytical contribution to the knowledge of 'water-soluble' copper.)]—*Z. PflKrankh.*, xlvi, 9, pp. 418–438, 1936.

After briefly surveying the various theories that have been advanced to explain the fungicidal effect of Bordeaux mixture the author states that the results of the laboratory experiments described in some detail in this paper would appear to support the view of Millardet, who ascribed the toxicity of the mixture to soluble copper compounds produced by the action of atmospheric carbon dioxide on the spray deposit under the influence of moisture. The experiments were made with powdered air-dry sediment obtained from 1–1–100 Bordeaux mixture, prepared according to the method of Wöber (*Z. PflKrankh.*,

xxix, [pp. 94–104], 1919), 1 litre of the mixture yielding 10 gm. spray deposit.

It was shown that both carbon dioxide and atmospheric moisture are indispensable for the liberation from the deposit of water-soluble copper compounds. The author considers that the deposit under the influence of carbon dioxide and atmospheric moisture undergoes a series of changes representing eight phases [which are tabulated], the final products being $CuSO_4$, $Cu(HCO_3)_2$, and $Ca(HCO_3)_2$. During dry periods the soluble copper compounds, by losing some of the carbonic acid, revert back to an insoluble state until the next precipitation, when the soluble compounds are again formed, and so on. These alternations are an important factor in the prophylactic efficacy of Bordeaux sprays, as the 'spurts' in the toxicity of the deposits coincide in time with the germination of the fungal parasite, and furthermore they protect the host against the scorching effect of the soluble toxic compounds, which is most troublesome during prolonged wet spells. Further tests showed that the toxic compounds are $CuSO_4$ and $Cu(HCO_3)_2$, and that they are of a crystalloid nature, since in solution they freely passed colloidal filters. In experiments on the effect of thickness of the deposit on toxicity, 10 gm. of the air-dry sediment was used to cover glass surfaces of from 500 to 5,000 sq. cm., and the treated surfaces were subjected to daily wetting and exposure to ordinary laboratory atmosphere at a temperature of 20° C. It was found that the thinnest films released daily 0·151 per cent. of soluble copper, while the thickest only released 0·006 per cent. at the end of the first 24 hours, 0·014 per cent. during the next period of 24 hours, and 0·025 per cent. during the fourth and consecutive periods tested. It was computed that the thinnest film could remain active under laboratory conditions for 150 consecutive days, but under the conditions that are usual in the open, it is not expected that a spray deposit could retain enough copper to be effective longer than six weeks. It is computed that at temperatures of about 20° C., the deposit left by 1–1–100 Bordeaux mixture on vine leaves liberates 0·000,001 gm. of water-soluble and active copper per sq. cm. of leaf surface in 24 hours. The work finally indicated that to be fully effective Bordeaux mixture should be applied in time to afford protection against invasion of the host by the parasite.

Schnegg (H.) & Weigand (K.). **Borsäure-Studien.** [Boric acid studies.] —*Zbl. Bakt.*, Abt. 2, xcv, 5–8, pp. 154–167, 1936.

An examination of 17 samples of 3 per cent. boric acid solutions obtained from chemists and druggists in different parts of Germany revealed contamination by micro-organisms (444 to 56,800 per c.c.) in all [cf. *R.A.M.*, xiv, p. 114], chiefly represented by pale and deep red *Torula* spp., *Dematium* [*Pullularia*] *pullulans*, and 'black yeasts', while a white *Torula*, *Penicillium glaucum*, *Oidium* [*Oospora*] *lactis*, and *Mucor racemosus* were also detected. The organisms remained viable for lengthy periods in the solutions, a red *Torula*, for instance, being detected after three years. Boric acid solutions prepared in the laboratory remained sterile after months of storage, and the contamination of the commercial solutions may be attributed to the presence of the

organisms concerned in the storage vessels even after cleansing. Other organisms tested could not withstand immersion in 1 to 4 per cent. boric acid solutions for longer than a fortnight at the most. The results of these experiments do not encourage the use of commercial boric acid for medicinal and food-preservative purposes.

Ahlberg (O.) & Ingelström (E.). **Sjukdomar och skadedjur som angripa våra viktigaste lantbruks- och trädgårdsväxter.** [Diseases and pests that attack our principal agricultural and horticultural plants.]—*Medd. Växtskyddsanst., Stockh.*, 17, 74 pp., 8 pl., 1936.

This useful compilation, arranged in alphabetical order of the hosts, contains much valuable information, clearly and concisely presented, on the symptoms, etiology, and control of some prevalent or economically important pests and diseases of agricultural and horticultural plants in Sweden.

Galloway (L. D.). **The storage of fungal cultures.**—*Indian J. agric. Sci.*, vi, 4, pp. 947–955, 1 fig., 1936.

Experimental tests on the storage of fungi, mainly saprophytic moulds, on sand in sealed tubes for one or two years based on Thaysen's method (*J. Inst. Brewing*, xl, p. 469, 1934) showed that many fungi possessing resistant spores or sclerotia retained their vitality for 1½ to 2 years when stored by this method. Such cultures should not be relied upon exclusively, however, for maintaining species in viable condition.

Hopp (H.). **Control of atmospheric humidity in culture studies.**—*Bot. Gaz.*, xcviii, 1, pp. 25–44, 8 figs., 1 diag., 2 graphs, 1936.

The author summarizes methods in vogue for the control of relative humidity and discusses in detail several new procedures with reference to their value in cultural studies. Chemical control is the most convenient for small closed chambers; intermittent vaporization controlled by a hygrostat and humidifier is best for large chambers.

Ramsbottom (J.). **The uses of fungi.**—*Rep. Brit. Ass., 1936*, pp. 189–218, 1936.

A comprehensive and interesting account is given of the various economic and industrial uses to which fungi are put.

McRostie (G. P.). **Advisory committee on plant diseases.**—*Rep. Canad. Seed Grs' Ass., 1935–1936*, pp. 31–33, 1936.

At the annual meeting of the Canadian Seed Growers' Association in 1932, an advisory committee on plant diseases was established, the report of which, listing various diseases known to attack some of the registrable crops in the country, and suggesting tentative percentages of tolerance, was presented in 1934. The adoption of this report, with certain modifications, is now (1936) recommended. In the case of ergot (*Claviceps purpurea*) in barley [*R.A.M.*, ix, p. 287], it is suggested that the percentage of tolerance be changed from 0·1 per cent. in the field or 1 per bush. to 0·5 per cent. or 10, respectively. As regards club root of swedes [*Plasmodiophora brassicae*: ibid., xv, p. 416], it is recommended that the tolerance be entirely omitted instead of the 10 per

cent. in resistant varieties originally scheduled in the report. Other proposed limits of tolerance include 5 per cent. mosaic in lucerne and sweet clover [*Melilotus alba*: ibid., xv, p. 274], 5 per cent. Stewart's disease (*Bacterium* [*Aplanobacter*] *stewarti*) in maize [ibid., xv, p. 573], 1 per cent. mosaic in beans [*Phaseolus vulgaris*: ibid., xv, p. 766; xvi, p. 22], and 0·5 per cent. *Ascochyta pisi* in peas, *Phoma betae* in beets, black rot of cabbage and cauliflower (*Pseudomonas campestris*), black leg of cauliflower (*Phoma lingam*) [ibid., xiv, p. 547], and bacterial canker (*Bact.* [*A.*] *michiganense*) [ibid., xv, p. 559] and leaf spot (*Septoria lycopersici*) of tomato.

Riker (A. J.) & Riker (Regina S.). **Introduction to research on plant diseases. A guide to the principles and practice for studying various plant-disease problems.**—117 pp., 14 diags., 2 graphs, published by the authors, University of Wisconsin, 1936. Price $2·65. [Mimeographed.]

This manual is designed primarily as a reference text of selected technique for research workers and advanced students. The eleven chapters deal with 'the foundation of a research problem; general laboratory equipment; culture media; certain physico-chemical measurements; isolation, culture, and inoculation; virus diseases; certain procedures for pathological history; epidemiology, environment, and control; statistical analyses; records and manuscripts; and laboratory exercise topics;' each is succeeded by a bibliography of the relevant literature. The work is eminently of service to students entering upon research, besides providing a useful reference book for experienced scientists.

Renn (C. E.). **Persistence of the Eel-Grass disease and parasite on the American Atlantic Coast.**—*Nature, Lond.*, cxxxviii, 3490, pp. 507–508, 1936.

Particulars are given of the writer's survey, during the early summer of 1936, of the position along the American Atlantic coast as regards the *Zostera* wasting disease [*R.A.M.*, xv, p. 820]. Symptoms of the decline were everywhere present and some beds, e.g., in Great Bay, Long Island, have entirely disappeared. The *Labyrinthula* previously described was universally present in an active state in the streaked or mottled leaves. Judging by past experience, the parasite may be expected to overwinter in the leaves in a quiescent state and to resume its virulent attacks during the early summer, when the vitality of the host is at a low ebb.

Lynn (Mary, J.). **The scarcity of Zostera marina (Slitch, Eel-Grass, or Grass-Wrack) in Strangford Lough.**—*Irish Nat. J.*, vi, 5, pp. 107–117, 1 fig., 1 map, 1936.

A detailed account is given of the serious incidence of wasting disease of *Zostera marina* in Strangford Lough, Co. Down, Northern Ireland, where neither *Ophiobolus halimus* nor *Labyrinthula* [see preceding abstract] has so far been detected. The narrow-leaved *Z. marina* var. *angustifolia* has been even more severely affected than the broad-leaved

form, contrary to observations elsewhere, but *Z. nana*, in the few areas where it occurs, appears to be healthy.

Cook (M. T.). **Records of virus diseases of plants in Puerto Rico.**—*J. Agric. P.R.*, xx, 3, pp. 681–684, 1936.

Of the virus diseases recorded in this paper the following may be mentioned. Pineapple yellow spot and wilt [*R.A.M.*, xv, p. 378] were introduced from Hawaii into Porto Rico in 1923 and 1931, respectively, on two shipments of Smooth Cayenne slips, which, while under observation for two years, appeared perfectly healthy; but the diseases were again found in both plantings in 1934. Similar but not precisely the same symptoms have been observed on Cabezona pineapples near Lajas. Spike disease, not observed in Porto Rico for thirteen years, was found recently in the Cabezonas. The first very severe outbreak of cucumber mosaic noted by the author during the same period occurred during the winter of 1935–6. Maize was affected by a white stripe disease [see above, p. 93] apparently identical with that reported from Cuba in 1927 [ibid., vii, p. 159] and Trinidad in 1933 [ibid., xii, p. 756]. Mosaic diseases were also recorded on *Crotalaria anagyroides*, *C. usaramoensis*, *Phaseolus lunatus*, and very rarely on bananas. 'Enano' plantains were affected by a condition, apparently of virus origin, characterized by failure of the spirals to unroll properly. Parts of the outer leaf may become dead, brown, and torn by the growth of the inner parts. When the leaves of the spiral unroll they are chlorotic and crinkled; in severe cases they turn brown and die.

Cook (M. T.). **First supplement to the host index of virus diseases of plants.**—*J. Agric. P.R.*, xx, 3, pp. 691–727, 1936.

This supplement to the author's host index of plant virus diseases [*R.A.M.*, xv, p. 107] adds 10 families, over 50 genera, and about 105 species to the original work.

Otéro (J. I.) & Cook (M. T.). **Second supplement to partial bibliography of virus diseases of plants.**—*J. Agric. P.R.*, xx, 3, pp.741–819, 1936.

This second supplement to the authors' partial bibliography of the literature of plant virus diseases [*R.A.M.*, xv, p. 40] deals with papers mostly published in 1934 to 1936. [The pagination given in the indexes appended appears to be consistently 4 pp. in excess of the correct numbers.]

Doerr (R.). **Allgemeine Merkmale der Virusarten.** [General characteristics of viruses.]—*Z. Hyg. InfektKr.*, cxviii, 6, pp. 738–747, 1936.

This is the report of a lecture, delivered at the second International Congress of Microbiology, held in London in July, 1936, on some of the outstanding general features of the ultra-microscopic viruses, including bacteriophage [*R.A.M.*, xv, p. 595], presented and critically discussed in the light of current researches. The author does not concur in the view that the viruses represent a natural entity or biologically uniform

group of infective principles, the evidence in favour of this hypothesis at the present stage being, in his opinion, totally unconvincing.

KOSTOFF (D.). **Virus and genic reactions in morphogenetic, physiogenetic, and phytogenetic aspects.**—*Phytopath. Z.*, ix, 4, pp. 387–403, 12 figs., 1936.

An attempt is made to present a comparative study and discussion on the nature and activity of viruses and genes on the basis of original observations and those of other workers in the same field. A number of analogies are drawn between these two ultra-microscopic entities, which appear, for instance, to belong to the same physico-chemical category of particles and to produce similar effects (systemic or local) in plants. Certain phenomena, such as variegation, may proceed either from viruses or from genes, while both groups share antigenic properties. Although it would be premature to claim that any proof is yet forthcoming of identity between viruses and genes, a clue to further studies along these lines is thought to have been afforded by the present, admittedly preliminary, investigations.

TROTTER (A.). **Ulteriori osservazioni sulle 'virosi' del Cestrum parqui L'Hér.** [Further observations on virus diseases of *Cestrum parqui* L'Hér.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 61–64, 2 pl., 1936.

During the spring of 1936, *Cestrum parqui* plants which in the previous year had shown mosaic symptoms [*R.A.M.*, xiv, p. 781] developed signs of ring spot [ibid., xv, p. 752] not previously recorded from Italy, though observed earlier by the author on tobacco and *Solanum nigrum*. The symptoms appeared very early in the year, as small, simple rings or zig-zag lines, and were followed later on the same plants by mosaic and leaf roll. Locally *C. parqui* is increasingly affected by viruses and seems likely to become a permanent focus of infection for the Solanaceous crops grown in the vicinity. At the end of 1935 diseased plants of *C. parqui* showed severe aphid infestation, and it was also observed that those with the most conspicuous virus symptoms were growing near large areas sown to potato, tomato, and tobacco.

BURGEFF (H.). **Samenkeimung der Orchideen.** [Seed germination of Orchids.]—viii+312 pp., 179 figs., 4 diags., 3 graphs, Jena, G. Fischer, 1936. Price Rm.18.

Following an explanatory foreword on the nature and functions of the fungal symbionts of orchids [*R.A.M.*, xi, p. 317], the writer deals with the following aspects of orchid cultivation in relation to mycorrhiza [ibid., xvi, p. 49]: cytological structure and function of orchid mycorrhiza; seed biology of orchids; seed germination in orchids; analysis of mycorrhiza (procurement and cultivation of symbiotic fungi, a concise survey of the orchid fungi hitherto isolated, fungus-free germination); the life of the symbiotic components; the main nutritional-physiological problem of seed germination in orchids; the principal physiological factors affecting orchid development; and an appendix on practical methods of orchid cultivation from seed.

A five-page bibliography is appended.

Köhler (E.). **Der Virusnachweis an Kartoffeln. Eine Anleitung für Züchter und Kartoffelbegutachter.** [The detection of virus in Potatoes. A manual for breeders and Potato surveyors.]—*Mitt. biol. Anst.* (*Reichsanst.*) *Berl.*, 53, 9 pp., 19 pl., 1936.

For the benefit of potato-breeders and surveyors concerned with the diagnosis of virus diseases in Germany the writer briefly describes the symptoms of leaf roll, the X group (ring mosaic), Y virus (streak) [*R.A.M.*, xv, p. 391], A virus [see next abstracts], leaf-rolling mosaic [ibid., xv, p. 739], various innocuous forms of mosaic restricted to greenhouse plants and not transmissible to tobacco, and different virus combinations. Directions are given for the application of three methods of diagnosis, viz., tuber-indexing [ibid., xv, p. 43], transmission to Samsun tobacco, and transmission by aphids; transmission by grafts is a lengthy and complicated process which should be reserved for scientific studies. A key for the differentiation of the viruses is given.

Murphy (P. A.) & Loughnane (J. B.). **A comparison of some Dutch and Irish Potato mosaic viruses.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 419–430, 1 pl., 1936.

An examination of some potato mosaic diseases sent from Holland for comparison with similar diseases found in Ireland [cf. *R.A.M.*, xiv, p. 523; xv, p. 738] showed the Dutch potato mosaics to correspond almost exactly with the Irish. Thus, super-mild mosaic (Bravo variety) showed the presence of virus A [ibid., xiii, p. 257; xv, p. 460]; easily inoculable mosaic (Alpha) that of X [ibid., xvi, p. 52], B, and a form of A; rugose mosaic (Institut de Beauvais) the veinbanding virus; latent virus (Zeeland Blue) X and a form of Y or A, and possibly an unidentified virus; latent virus (Monocraat) F [see next abstract]; latent virus (Magdeburger Blaue) X and B; interveinal mosaic (Bravo) X and F; and crinkle mosaic (Bravo) X and A. Another combination, A and F, was also found possible, resulting in a yellow mosaic of the lower leaves, resembling aucuba mosaic, but apparently distinct. This list probably represents the more important potato mosaics of north-western Europe and its comparative shortness indicates that experimental research has thrown excessive emphasis on the different effects of a virus on different varieties.

The discovery in the present work of two viruses intermediate between Y and A raises very important questions as to the independence of the new forms. Thus, the aphid-transmitted virus from Alpha potatoes most resembles A, but is not identical with it, with the result that it is at present uncertain whether to regard it as a form of A or not. The corresponding virus from Zeeland Blue potatoes is more like Y, but possesses some properties of A, so that it may be a form of Y or A, or independent. At present, the evidence does not support the identity of Y and A, though it is believed that they belong to one and the same broad group.

The A, B, F, X, Y, and veinbanding viruses appear to underlie most potato mosaics of favourable maritime climates, but in continental areas, other viruses in addition are commonly implicated in potato degeneration. The virtual absence in north-western Europe of many serious American affections must be due to a failure to maintain the

requisite balance between virus and potato, as a result of which they have died out.

Clinch (Phyllis E. M.), Loughnane (J. B.), & Murphy (P. A.). **A study of the aucuba or yellow mosaics of the Potato.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 431–448, 3 pl., 1936.

In this paper an account is given of a comparative study of the symptoms and properties of aucuba mosaic of potato (different from tomato aucuba mosaic) [*R.A.M.*, xiv, p. 385; xv, p. 831], potato 'tuber blotch' virus [ibid., xiv, p. 605], and a latent virus from the Dutch potato Monocraat. All three were readily transmissible by sap to potato and other Solanaceous plants. The aucuba virus [the foliage and tuber symptoms of which on 14 potato varieties are tabulated] caused a yellow mottle on the lower or middle leaves of all the varieties tested, with cortex and pith necrosis on seven of them. The other two caused a similar but inconspicuous mottle of the lower leaves, sometimes preceded by the primary symptoms of rusty wilt, or no symptoms at all, in the 25 varieties tested, with a similar tuber necrosis in 13 of them. All three viruses produced identical diagnostic symptoms on *Solanum nodiflorum* and *Capsicum annuum*, consisting of brown- or purple-bordered spots, followed by rusty purple discoloration and mosaic. Inoculated into tobacco, *Datura stramonium*, and *Petunia* the three viruses produced no symptoms, aucuba mosaic, however, being differentiated from the other two by producing symptoms on tomato and *S. dulcamara*. The physical properties, including filterability (passing L1 but not L3 filters), thermal death point (all falling between 62·5° and 65° C.), and longevity *in vitro* (between 2 to 6 days) were similar in the three viruses. The tuber blotch virus was transmitted by *Myzus persicae*, but only in the presence of virus A [see preceding abstracts]. This virus and the Monocraat virus are identical, and probably correspond to the virus of pseudo-net necrosis, the aucuba virus being a distinct but related form, and the calico virus [ibid., xv, p. 459] probably related as well. The tuber blotch virus is designated F with the Monocraat virus as a synonym, and the aucuba mosaic virus G.

Potato mosaics fall into three broad groups: (1) viruses of the X type (including mottle, ring spot, healthy potato virus and the like), causing distinctive mosaic symptoms in tobacco, *D. stramonium*, *Petunia*, and other Solanaceous hosts, producing acronecrosis on Arran Crest potatoes, forming crinkle in combination with virus A, non-transmissible by *M. persicae*, and passing an L3 Pasteur-Chamberland filter candle; (2) viruses of the F type (including pseudo-net necrosis, virus G, and possibly calico virus) producing brown or purple-fringed spots on *S. nodiflorum* and *C. annuum*, followed by clear mosaic on the latter, carried without symptoms by tobacco and *D. stramonium*, producing bright yellow spotting on the lower leaves of potatoes intensified by the presence of virus A, causing hereditary parenchyma necrosis in the tubers of many varieties, transmitted by *M. persicae* in certain cases and conditions, and not passing an L3 filter candle; (3) viruses of the Y group (including virus A and veinbanding virus), readily transmissible by *M. persicae*, producing green veinbanding in tobacco, non-inoculable to *D. stramonium*, non-filterable through L3 candles, and typically

causing acropetal necrosis in certain varieties, though this varies in the case of virus A.

Garbowski (L.). **Ocena zdrowotności kłębów Ziemniaczanych drogą wstępnej hodowli kiełków.** [Determination of the health of Potato seed tubers by preliminary culture from the eyes.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 31–41, 1936. [French summary.]

Experimental evidence is presented demonstrating the practical value of tuber-indexing seed potatoes as a means of testing their freedom from virus diseases (mosaic and crinkle) [cf. above, p. 116].

Muller (H. R. A.). **Kalkgebrek en mergnecrose (roestvlekkenziekte) bij Aardappelen.** [Calcium deficiency and medullary necrosis (rusty spot disease) of Potato tubers.]—*Landbouw*, xi, 9, pp. 345–369, 1936. [English summary.]

Medullary necrosis of potato tubers [*R.A.M.*, xv, p. 253] is a very serious disease in many parts of Java and Sumatra where the limiting factor in production is calcium deficiency. From unpublished data obtained by H. C. Bongers from 1919 to 1921 it is stated that in field experiments lime dressings applied at the rate of 125 q. per hect. reduced the percentage of affected tubers from 96·8 to 26 and the symptoms, when present, were so slight that the commercial value of the crop was unimpaired. Even better results were obtained in another experiment when the application of lime at the rate of 35 q. per hect. reduced the number of diseased tubers from 94·8 to 10·4 per cent. Stable and green manures and sulphate of ammonia tended to increase the losses from the disease and superphosphate to reduce them. The disease is considered to be the same as internal brown fleck described from South Africa [ibid., xiii, p. 394]. Evidence was obtained that lime deficiency also exerted an adverse effect on maize.

Potato diseases of Victoria.—*J. Agric., Vict.*, xxxiv, 9, pp. 464–481, 24 figs., 1936.

Brief, popular notes are given on the symptoms and control of potato diseases in Victoria, including *Rhizoctonia* [*Corticium solani*], common scab (*Actinomyces* spp.) [*A. scabies*], late blight (*Phytophthora infestans*), early blight (*Alternaria solani*), powdery scab (*Spongospora subterranea*) [ibid., xvi, p. 59], black leg (*Bacillus phytophthorus* group), bacterial wilt (*Bacterium solanacearum*) [ibid., xv, p. 459], silver scurf (*Spondylocladium atrovirens*) [see below, p. 144], stringy rot (*Armillaria mellea*) [ibid., xiii, pp. 257, 552], brown fleck [?internal rust spot: ibid., xvi, p. 56], glassy end [ibid., xv, p. 821], sun scald, black heart [ibid., xi, pp. 126. 357], dry rot (*Fusarium* sp.), and spindle sprout [ibid., xv, p. 247].

Swartele (A. A.) **Bestaat er een verband tusschen het voorkomen van black heart en het optreden van virusziekten bij den Aardappel?** [Is there a connexion between the occurrence of black heart and the development of virus diseases in the Potato?]—*Tijdschr. PlZiekt.*, xlii, 9, pp. 241–252, 1 pl., 1936. [English summary.]

According to Biourge and Sokal (*Ann. Soc. sci. Brux.*, B, xlix, p. 68,

1929; *Agricultura, Louvain*, 1930, 1932; *C. R. Soc. Biol., Paris*, ciii, p. 955, 1930), black heart of potatoes [see preceding abstract] is due, not to lack of oxygen, followed by asphyxiation of the centre of the tuber, but to infection by *Bacillus mesentericus vulgatus* and *B. mesentericus ruber*. These workers further maintained that tubers affected by black heart give rise to plants showing the symptoms commonly attributed to viruses.

In the writer's experiments, however, no connexion could be traced between the occurrence of black heart in the tubers and that of viruses in the plants, while the inoculation of healthy tubers with the reputed bacterial agents of the disease gave entirely negative results. Climatic factors and soil constitution are thought to be probably the decisive, though not the only, factors in the development of black heart, which is particularly prevalent on poor ground and in tubers lifted later than usual. No correlation could be detected between the melanin content of the tubers and the incidence of black heart.

Leszczenko (P.). **Dezynfekcja gleby zakazonej rakiem Ziemniaczanym Synchytrium endobioticum (Schilb.) Perc. Komunikat tymczasowy.** [Disinfection of soil infected with Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc. Preliminary communication.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 61–71, 1936. [English summary.]

The results of experiments in 1934 and 1935 at Rzadkowo, Poland, showed that the Wohltmann potato, highly susceptible to wart disease (*Synchytrium endobioticum*), remained entirely unaffected in heavily contaminated soil treated with 12·5 or 25 l. of a 0·4 or 0·8 per cent. formaldehyde solution per sq. m., while adjacent control plots showed from 90 to 100 per cent. infection [*R.A.M.*, xv, p. 393]. Concentrations of 0·1 and 0·2 per cent. formaldehyde at 25 l. per sq. m. were ineffective.

Garbowski (L.) & Leszczenko (P.). **Badanie odporności Ziemniaków na raka Ziemniaczanego Synchytrium endobioticum (Schilb.) Perc.** [Potato tests for resistance to Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 43–60, 1936. [French summary.]

The results of tests in 1934 and 1935 in Poland of 67 potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xiv, p. 526] showed that among others the Scottish variety Incomer and the German Modrow's Preussen original were definitely susceptible. The new Polish varieties Ajaks, Atena, Barbara, Cella, Hajduk, Herkules, Hymen, Ikar, Ilion, Iris, Kastor, Kazimierz, Mentor, Neotopaz, Orkan, and No. 201 Plomyk remained immune, both in the laboratory and field tests.

The second section of this paper gives a review of recent work on the genetics of resistance in the potato to wart disease, together with some observations by the authors indicating that conclusions should

be based on the results of laboratory infections rather than on those of field trials.

NĚMEC (A.). **Biochemické studie k otázce rakoviny Bramborů. I. Složeni minerálnich látek v hlízách resistentnich a neresistentnich odrůd Bramborů.** [Biochemical studies on the problem of Potato wart disease. I. Composition of the mineral substances in resistant and susceptible Potato varieties.]—*Ann. Acad. tchécosl. Agric.*, xi, 3, pp. 310–316, 1936. [German summary.]

In continuation of his studies of the conditions conducive to outbreaks of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xiv, p. 650], the author investigated the mineral composition of the ash obtained from the tubers of 16 immune and 16 susceptible potato varieties. The results showed no significant difference in the phosphoric acid, lime, silicic acid, or sulphuric acid contents of the tubers of the two groups. On the other hand, the immune varieties were shown to have a markedly higher content in magnesium (average 0·248 per cent. MgO) than the susceptible (0·165 per cent.) and a moderately higher content in potassium and manganese. Particular significance may be attached to the lime : magnesium oxide ratio, which on the average was 3·18 in the immune and 2·02 in the susceptible varieties, as well as to the potassium oxide : magnesium oxide ratio (average 9·99 in the immune and 14·21 in the susceptible).

NĚMEC (A.). **Über die Zusammensetzung der Mineralstoffe in krebsbefallenen Kartoffelknollen.** [On the composition of the mineral substances in wart-infected Potato tubers.]—*Phytopath. Z.*, ix, 4, pp. 417–425, 1936.

A tabulated account is given of the author's investigations on the mineral composition of the ash of healthy and wart- [*Synchytrium endobioticum*: see preceding abstract] diseased potato tubers of various varieties from different places in Bohemia. Apart from differences attributable to the differences in the soil and other environmental conditions under which the potatoes had been grown, the results consistently showed that the diseased tubers yielded less total ash and contained less magnesium than the apparently healthy tubers of the same variety, while lime was somewhat more abundant in the former, the average figures obtained being ash 3·8, magnesium oxide 0·240, and lime 0·120 per cent. of the dry substance in the healthy tubers, as against 2·247, 0·075, and 0·136 per cent., respectively, in the diseased tubers. On incineration the wart proliferations gave on the average ash 2·553, magnesium oxide 0·046, and lime 0·211 per cent., showing that they contained less magnesium and more lime than whole diseased tubers. The magnesium oxide : lime ratio varied from 1·85 to 2·68 in the various healthy, and from 1·09 to 1·55 in the diseased, tubers tested, being consistently lower in the latter. It is suggested that the reduction in magnesium which was found in the wart diseased tubers may be due, at least in part, to the fact established by Weiss and Harvey [*R.A.M.*, i, p. 131] that *S. endobioticum* has an acidifying effect on the juice of the potato tubers attacked by it.

Wieringa (K. T.) & Wiebols (G. L. W.). **De Aardappelschurft en de heterolyse der schurftparasiet.** [Potato scab and the heterolysis of the scab parasite.]—*Tijdschr. PlZiekt.*, xlii, 9, pp. 235–240, 1 pl., 1936.

The development of Actinomycetes in the soil is limited by two forms of antagonism, active and passive, the former comprising the action of (*a*) heterolytic agents, and (*b*) filterable and transmissible bacteriophages, and the latter competition with other micro-organisms and the production of growth-inhibiting substances. Details are given of experiments in which the bacteriophages derived from cultures of *Actinomyces roseus*, *A. bovis*, and *A. farcinicus* [*R.A.M.*, vii, p. 241] were applied to the causal organism of potato scab, *A. scabies*, with very successful results both on solid and liquid bouillon media in the case of the bacteriophage of *A. bovis*, which also induced lysis of *A. farcinicus* cultures. Further studies are planned to determine the practical possibilities of this method of combating the disease.

Lutman (B. F.), Livingston (R. J.), & Schmidt (A. M.). **Soil Actinomyces and Potato scab.**—*Bull. Vt agric. Exp. Sta.* 401, 32 pp., 4 pl., 20 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 5, pp. 644–645, 1936.]

A fairly full review is presented of the published work on potato scab (*Actinomyces*) [spp. including *A. scabies* : *R.A.M.*, xvi, p. 58 and preceding abstract], accompanied by discussions of the methods of soil counts and plating out of the micrō-organisms [ibid., ix, p. 58; xiv, p. 392], the species of *Actinomyces* being differentiated into two groups, one colourless and the other producing a brown pigment on culture media [ibid., xiii, p. 50].

During the period from 1914 to 1917 susceptible varieties were grown on two field plots (sandy and heavy clay loam, respectively) to determine their reaction to the disease, with the result that nearly 100 per cent. of badly scabbed tubers developed on the former soil and almost as many on the latter in 1916. Potatoes were excluded from the rotation in the sandy loam plot between 1916 and 1934, but were twice planted on the heavy clay during the same period. From 1924 to 1931 inclusive bacterial counts were made monthly by the plating out method (1 in 1,000,000 dilution), the total numbers of micro-organisms and actinomycetes being determined on a 1 gm. of dry soil basis.

The peak was reached during the winter (November to April), coinciding with the maximum degree of soil moisture. The *Actinomyces* counts were roughly parallel with those of the total incidence of micro-organisms, and during the eight-year period the numbers of the former remained relatively stable. The *Actinomyces* occurred mainly in the form of mycelial fragments with comparatively few spores.

Disinfected Green Mountain potato seed planted on the sandy loam soil in 1935, after a 19-year absence, yielded 70·2 per cent. clean tubers, 26·5 per cent. slightly scabbed, and 3·3 per cent. badly scabbed, the corresponding figures for the 1916 crop being 0·0, 0·8, and 99·2 per cent., respectively. The senior author is inclined to believe that the pathogenic species of *Actinomyces* do not actually die out of the soil

in the absence of potatoes but merely undergo a diminution of pathogenicity in the presence of uncongenial crops and regain their virulence on the return of the preferred host.

ALLINGTON (W. B.). **Sclerotial formation in Rhizoctonia solani as affected by nutritional and other factors.**—*Phytopathology*, xxvi, 9, pp. 831–844, 1 fig., 1936.

The effect of nutritional factors, temperature, and hydrogen-ion concentration of the substratum on sclerotial production by *Rhizoctonia* [*Corticium*] *solani* from potato [*R.A.M.*, xv, p. 46] in Nebraska was studied in pure culture on potato dextrose agar and a modified Czapek's medium.

No sclerotia were formed until all the agar in the dish was covered by the colony. The process was favoured by a relatively low carbohydrate and high nitrogen content of the medium, the most powerful stimulus being given by calcium nitrate, followed in decreasing order by asparagin, ammonium nitrate, urea, and sodium nitrate. Glucose, sucrose, and potato starch were equally efficacious as sources of carbon, but glycerol and lactic acid were not readily utilized by the fungus. *C. solani* made the most luxuriant growth at P_H 7, sclerotia being formed in profusion; at 4, 5, and 6 the number of these organs was reduced and at 8 they failed to develop. The maximum growth of the fungus was made at 25° C. [ibid., viii, p. 138; xiv, p. 208]; at 5° it was unable to develop but remained viable. Sclerotia were formed in 20 days on healthy seed potatoes buried in inoculated soil, so that sound seed-pieces may contract infection after planting.

MUNDKUR (B. B.). **A Rhizoctonia on Sweet Potatoes in Bombay.**—*Indian J. agric. Sci.*, vi, 4, pp. 994–995, 1 pl., 1936.

Sweet potatoes in the vicinity of Kawar, Bombay Presidency, are rather commonly affected by a strain of *Rhizoctonia solani* (*Corticium vagum*) [*C. solani*] causing shrivelling and dwarfing of the roots with the production of two to four sclerotia on the skin. This is the first record of the fungus on sweet potato in India.

RAMIAH (K.) & RAMASWAMI (K.). **Breeding for resistance to Piricularia oryzae in Rice (O. sativa).**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 450–458, 1936.

In breeding work at Madras against rice blast (*Piricularia oryzae*) [*R.A.M.*, ix, p. 87; xii, p. 266; xv, p. 779] two highly resistant strains GEB. 24 and Co. 4 were crossed with the susceptible variety Korangusamba from Tanjore on which the disease first occurred locally, and which in artificial infection studies showed up to 80 per cent. infection. Inheritance of resistance appeared to be simple in GEB. 24 × Korangusamba, and more complicated in the other cross. In the former, disease-free selections from F_3 onwards bred pure for freedom from disease and after two years' trials in two localities two showed 10 to 50 per cent. increase in yield over the susceptible variety. In a postscript it is stated the same two strains gave 14 to 80 per cent. increased yield in 1935–6.

Luthra (J. C.) & Sattar (A.). **Some studies on the sclerotial disease of Rice (Sclerotium oryzae Catt.) in the Punjab.**—*Indian J. agric. Sci.*, vi, 4, pp. 973–984, 1 col. pl., 1936.

In the Punjab, the rice disease caused by *Sclerotium oryzae* [*Leptosphaeria salvinii*: see above, p. 97] occurs chiefly as a stem rot, though occasionally as a withering of the leaf blades and sheaths. In many cases, the only symptom is a discoloration of the stem bases, generally following by wilting. On frequent occasions sclerotia have been found on the stubble, though the standing crop appeared healthy.

In pot tests, infection was secured by planting rice seed or healthy seedlings in soil inoculated with diseased stubble or a pure culture of the fungus. Seedlings raised in infected soil and transplanted to inoculated and clean soil developed infection. Stem inoculations of seedlings also gave positive results, and the fungus was reisolated from the diseased plants, which showed characteristic symptoms. When seed of 19 rice varieties was sown in inoculated and uninoculated field plots infection developed in the former only, a similar result being obtained with seedlings transplanted from clean to inoculated soil, and (though to a less extent) with others transplanted from inoculated to clean soil. Marked differences in varietal susceptibility were noted, Nos. 370, 3/30, 7, 202, and 62 being amongst the more resistant strains. Experimental evidence demonstrated that infection results when rice is grown in soil that has borne a diseased crop the previous year.

Katsura (S.). **The stunt disease of Japanese Rice, the first plant virosis shown to be transmitted by an insect vector.**—*Phytopathology*, xxvi, 9, pp. 887–895, 1936.

This is a review, accompanied by explanatory comments, of the literature on 'stunt' (commonly known as 'dwarf') disease of rice, carried by the leafhopper, *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xv, p. 48], the earliest record of which in the Shiga prefecture of Japan dates from 1883; it is stated to be the first authenticated case of the transmission of a virus by an insect vector.

Kalinenko (V. O.). **The inoculation of phytopathogenic microbes into rubber-bearing plants by nematodes.**—*Phytopath. Z.*, ix, 4, pp. 407–416, 7 figs., 1936.

Nematodes (*Tylenchus* spp. and *Aphelenchus avenae*) infesting two new species of rubber-bearing plants (*Taraxacum kok-saghys* Rodin and *Scorzonera tau-saghys* Lip. & Bos.) in the U.S.S.R. have been found to bear both in and on their bodies various bacteria, including *Bacillus carotovorus* and *Bacterium phaseolorum*, which were shown by inoculation experiments with pure cultures to aid the insects in the production of a destructive root rot.

Doran (W. L.). **Vinegar as a soil disinfectant.**—*Science*, N.S., lxxxiv, 2177, pp. 273–274, 1936.

Satisfactory control of damping-off (*Pythium*) [*de Baryanum*] and *Rhizoctonia* [?*Corticium solani*] in seed-beds of beet, cress (*Lepidium sativum*), and various ornamentals in Massachusetts was obtained by

the application to the soil of a dust containing about 23 per cent. acetic acid in a carrier of powdered wood charcoal, at the rate of 42 gm. per sq. ft. of surface. Good results were also given by the incorporation with sandy soils of four brands of commercial cider vinegar containing an average of 4·3 per cent. acetic acid, using ½ pint per sq. ft. of soil 3 in. deep, in beds sown with beet, lettuce, cabbage, tomato, and various ornamental seeds [cf. *R.A.M.*, xi, pp. 492, 589; xiii, p. 412; xiv, p. 7].

Noll (J.). **Bodendämpfung. (Entseuchung des Bodens mit Dampf.)** [Soil steaming. (Soil disinfection with steam).]—*Kranke Pflanze*, xiii, 9, pp. 151–154, 1 pl., 1 fig., 1936.

The writer describes various types of steam apparatus (including the Pillnitz tip-wagon and upright, low-pressure boiler, and the Pillnitz soil-steaming column, Firma Buschmann, Lommatzsch) for large- and small-scale soil sterilization operations against fungi and other micro-organisms and soil exhaustion in Germany [*R.A.M.*, xi, p. 589; xii, p. 460], and gives concise directions for their use.

Nath (V.). **Disease resistance in plants in relation to nutrition balance.** —*Proc. Indian Acad. Sci.*, iii, 6, pp. 459–469, 1936.

A five years' investigation by the author in collaboration with T. L. Rao and M. R. Balakrishnan of a gradual deterioration of betel (*Piper betle*) vines accompanied by eelworm (*Heterodera radicicola*) [*H. marioni*] infestation and several fungi, including a *Rhizoctonia* [cf. *R.A.M.*, xiv, pp. 122, 718] which caused blackening and death of the stems, demonstrated conclusively that the diseased condition was due mainly to adverse soil factors. With improved soil conditions the yield became practically normal.

Analysis of the ash of leaves from six *Hevea* rubber trees suffering from abnormal leaf fall associated with *Phytophthora* [*meadii*: ibid., xiv, p. 123] showed the percentage potash content to range from 5·32 to 14·4 and from 20·7 to 26·76 for the healthy and infected leaves, respectively, the corresponding figures for periodical collections from the same trees being 10·9 to 12·6 and 19·0 to 25·4.

Krishnaswami (C. S.). **Studies in disease resistance in crop plants in the Madras presidency. II. Estimation of disease resistance in Sugarcane mosaic.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 481–490, 1 graph, 1936.

Experiments carried out at Coimbatore showed the following sugarcane varieties to be highly resistant to mosaic: P.O.J. 2878, Co. 214, 244, 315, 316, and 335, while Co. 355, 356, 412, and 413 are resistant [cf. *R.A.M.*, xv, p. 777]. Co. 360 and 361 appeared to show genuine recovery from infection as the plants grew older and inoculation tests indicated the development of a kind of immunity [loc. cit.]. Tests with Co. 205 from Pusa, where it is susceptible [ibid., x, p. 360], gave about 4 per cent. mosaic in the first year, presumably due to primary infection, but subsequently no further disease developed on this variety under Coimbatore conditions.

Dutt (N. L.), Hussainy (S. A.), & Krishnaswami (M. K.). **A note on the breeding of Sugarcane varieties resistant to mosaic.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 425–431, 1 fig., 1936.

In investigations reported in this paper the authors found no support for the view that mosaic resistance is correlated with the presence of bristles on the leaves of sugar-cane [*R.A.M.*, vii, p. 475]. Coimbatore canes containing *Saccharum spontaneum* 'blood' were found generally resistant to or tolerant of mosaic.

Brandes (E. W.). **Transmission of new types of Sugar-Cane mosaic and some observations on significance of the diseases.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 804–811, 1 fig., 1936.

With the sole exception of C.P. 807 all the sugar-cane varieties tested in Louisiana, including the tolerant varieties, have been found susceptible to Summers's strain 3 of mosaic [*R.A.M.*, xiv, p. 123], which causes a much more severe type of disease on commercially important varieties than the type familiar since 1919. Experiments [which are described in detail] begun in 1934 confirmed the menacing character of the disease, and indicated that vigorous steps will be necessary to bring it under control. Strain 3 proved to be readily transmissible by *Aphis maidis* from diseased to healthy sugar-cane, the inoculated plants showing disease symptoms after a minimum of 11 days. It was also demonstrated that Creole maize is susceptible, but developed different symptoms from those of sugar-cane: instead of the bold white stripes and early necrosis seen on the latter host, the maize plants exhibited a fine mottling of the inner leaves, similar to ordinary mosaic on Creole maize. In about a week, however, these slight symptoms faded, and the plants wilted and died. Needle-prick inoculations from the maize leaves, before wilting, into sugar-cane leaves resulted in very pronounced symptoms of strain 3 mosaic in 19 days. Further preliminary experiments made to determine the origin of this type of mosaic, and to ascertain whether the virus was stable or could be changed by simple manipulation, gave negative results.

The new form of the disease occurs, fortunately, in only a few localities, and in small amount. Eradication appears to be possible, but should not be relied upon entirely. Attention must be given to these new strains of the mosaic virus in future breeding work.

Pemberton (C. E.). **The insect vectors of virus diseases of Sugar-Cane.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 118–120, 1936.

The author suggests that *Perkinsiella vitiensis* is the vector of Fiji disease of sugar-cane [*R.A.M.*, xv, p. 320] in Fiji, where this insect is prevalent and, apart from the discovery of a single specimen of *P. saccharicida*, is the only species of *Perkinsiella* recorded for the Island. It is probable that several or all of the species may act as vectors of the disease, and a list is given of the known species of the genus and their geographical distribution.

The reported presence of streak disease [ibid., xv, p. 744] in

Mauritius, India, and Egypt suggests that in these countries species of *Cicadulina* other than *C. mbila*, found in South Africa, may be vectors.

Bell (A. F.). **Two inoculation methods.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 199–200, 2 figs., 1936.

A description is given of two forms of apparatus for rapidly inoculating large quantities of sugar-cane planting material in routine varietal resistance trials, without the necessity for immediate planting. The first, or 'pressure inoculator', consists of a cast-iron cylinder with a small, flanged, stainless steel cup fixed in the centre of the base, the upper rim of the cup being machined to a fine cutting edge bevelled outwards down to the flange. A suspension of the inoculum is poured into the cylinder, until the cutting edge of the cup is covered and by forcing the cut sett centrally and vertically downwards until stopped by the flange, the fluid in the cup is forced up through the vascular system of the sett. In the second, or 'stab inoculator', the cup is replaced by four stainless steel spikes, the sett being pressed down vertically on two or more of them. This apparatus has a slight advantage over the pressure inoculator as regards speed, and the treatment of thin or dried setts.

Cottrell-Dormer (W.). **The variability of plant pathogens.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 712–722, 2 figs., 1936.

In this paper the author discusses the practical significance of variability in plant pathogens in relation to crop improvement and protection, examples being taken from fungi, bacteria, and viruses, and a note added on cases of variation in varietal resistance to disease. In the course of a study of *Bacterium albilineans* [*R.A.M.*, xv, pp. 560, 607] sectors of two types were observed in giant and large colonies: A, smooth, almost hyaline, and usually growing rapidly, with the inner angle generally rounded, highly refractile, and showing a clear demarcation from the parent growth, and B, rough, fine to coarsely granular, growth rate varying but sometimes very slow and leading to the formation of distinct lights in the margin of the parent colony, and with the inner angle sharply and finely tapering into the parent growth, where it became lost. Very rough forms were smaller and more curved than the smooth forms; these last quite resembled the parent. In no instance did sectoring occur until three weeks after inoculation and all attempts to maintain the rough forms in a pure condition failed. Sectoring was also observed in colonies of the causal organisms of gumming [*Bact. vasculorum*: ibid., xv, p. 466] and mottled stripe [*Phytomonas rubrisubalbicans*: ibid., xi, p. 473]. From a general review of the subject it is concluded that every species of pathogen contains a number of more or less well differentiated strains, and that new genotypic forms arise from time to time in pathogens of all types.

Caminha (A.). **Sugar Cane diseases in Brazil.**—*Brasil Assuc.*, vii, 4, pp. 209–213, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 12, p. 471, 1936.]

The major sugar-cane diseases in Brazil [*R.A.M.*, xiv, p. 718] are gummosis [*Bacterium vasculorum*], mosaic, sereh [ibid., ix, p. 857;

xv, p. 317], and red stripe [*Bact. rubrilineans*: ibid., xv, p. 606]. The first-named was formerly very injurious to the Otaheite variety, but with the introduction of resistant canes it has practically disappeared, while mosaic has been largely suppressed by the cultivation of P.O.J. 36, 213, and 228 in the cooler subtropics. P.O.J. 979 is liable to show mosaic symptoms up to the age of four or five months, after which all signs of infection gradually disappear and by 12 to 14 months have been completely eliminated. P.O.J. 2878 is virtually immune from mosaic. A seedling, CB. 6032, has been developed combining resistance to both mosaic and sereh. Red stripe was first observed in Campos in 1931 and is very severe on P.O.J. 2727, whereas P.O.J. 979 and 105 and Co. 213, 281, and 290 are resistant or tolerant.

CAMINHA (A.). **Sugar Cane diseases in Brazil : II.**—*Brasil Assuc.*, vii, 5, pp. 289–290, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 11, p. 427, 1936.]

Among the minor diseases of sugar-cane in Brazil [see preceding abstract] are: 'round spot' (*Leptosphaeria sacchari*) [*R.A.M.*, xv, p. 606], to which P.O.J. 2714 is highly susceptible, while Kassoer seems to be virtually immune; 'long spot' (*Helminthosporium sacchari*) [ibid., xv, p. 462], on B.H. 10/12, D. 74 and 625, and P.O.J. 2878 and 2727; 'grey spot' (*H. stenospilum*) [ibid., xv, p. 606]; red sheath spot (*Cercospora vaginae*) [ibid., x, p. 777], very severe on P.O.J. 2727; and red sheath rot (*Sclerotium rolfsii*) [ibid., xv, p. 465], attacking young shoots in wet soils.

ABBOTT (E. V.). **Physiologic specialization in Colletotrichum falcatum Went.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 730–736, 3 figs., 1936.

In a further comparative study of 85 isolations of *Colletotrichum falcatum* [*R.A.M.*, xii, p. 724] two morphological groups were distinguished on the basis of the colour and texture of the mycelium, one being dark grey and velvety, and the other nearly white to light grey and cottony. The dark types were found almost exclusively in Mississippi, Georgia, and northern Florida, only the light ones in southern Florida, and both in Louisiana. With few exceptions, the light types were more virulent on P.O.J. 213 sugar-cane than the dark ones; the light ones from southern Florida were less virulent than most of the similar forms from Louisiana.

The light type L–31 showed a relatively high virulence on the resistant variety Co. 281, as compared with the other isolations [loc. cit.]. As, however, it did not always show the same high virulence on P.O.J. 213 when compared with a large number of isolates, it is doubtful whether it can be regarded as a separate physiologic form. So far this is the only established instance of an isolation of *C. falcatum* showing a preference for a certain sugar-cane variety, though others might be found if a sufficient number of differential hosts were used. Though there is evidence therefore of physiologic specialization in *C. falcatum*, proof is lacking that physiologic forms exist in the sense of those described for the cereal rusts. The light and dark types isolated might be regarded as varieties of *C. falcatum* but the differences in colony

appearance do not appear to be correlated with other morphologic characters. The author considers that *C. falcatum* constitutes a parallel case with *Pythium aphanidermatum* [ibid., xiv, p. 94] and that no sub-division of the species is warranted at present.

Brandes (E. W.), Dowell (C. T.), & Baker (R. L.). **C.P. 29/116 Cane in Louisiana.**—*Sug. Bull.*, xiv, 22, pp. 1–4, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 11, p. 427, 1936.]

The cane variety C[anal] P[oint] 29/116 is recommended to Louisiana growers as a possible substitute on black lands and other secondary soils for Co. 290 [*R.A.M.*, xv, p. 826], should the latter not maintain its superior qualities. Both possess an adequate degree of vigour and resistance to root rot [chiefly *Pythium arrhenomanes*: ibid., xv, p. 826] while C.P. 29/116 appears to withstand mosaic better than 290, but is liable to red rot [*Colletotrichum falcatum*: loc. cit.; see also preceding abstract].

O'Connor (P.). **A contribution to knowledge of the Irish fungi.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 381–417, 1936.

This is a list of about 335 fungi found in the Irish Free State during the years 1932 to 1935.

Yamamoto (W.). **Cercospora-Arten aus Taiwan (Formosa) III.** [Species of *Cercospora* from Taiwan (Formosa) III.]—*Trans. nat. Hist. Soc. Formosa*, xxvi, pp. 279–286, 2 figs., 1936.

An annotated list is given of 16 species of *Cercospora* (4 new, with Latin diagnoses) collected on living foliage in Formosa during 1933–4 [cf. *R.A.M.*, xiv, p. 471], among which may be mentioned *C. atricincta* on *Zinnia elegans*, *C. buddleiae* n.sp. on *Buddleia madagascariensis*, *C. celosiae* on *Celosia cristata*, *C. ceratoniae* on *Ceratonia siliqua* [ibid., xii, p. 660], *C. cryptostegiae* n.sp. on *Cryptostegia* sp. imported from India, *C. hydrangeana* on *Hydrangea angustipetala* Hayata and *H. macrophylla*, *C. punicae* on pomegranate [ibid., ix, p. 613], and *C. viridula* on *Ipomoea indica*.

Danelia (B. K.). Болезни Чайного куста в условиях Западной Грузии. [Diseases of the Tea bush in Western Georgia.]—*Sovetsk. Subtrop., 1936*, 8 (24), pp. 56–61, 6 figs., 1936. [English summary.]

Out of a total of some 40 species of fungi found living on the tea bush in Western Georgia [Transcaucasia] the most widespread and economically important are stated to be *Colletotrichum camelliae* [*Glomerella cingulata*: *R.A.M.*, xvi, p. 1], *Cercoseptoria theae* [ibid., xiii, p. 129], and *Pestalozzia theae* [ibid., xv, p. 521]. The author suggests that all of these organisms should be easily controlled by improved cultural practices and by spraying the bushes with Bordeaux mixture. A serious wilt, associated with various fungi, frequently kills up to 15 per cent. of the tea seedlings.

Gadd (C. H.). **Diseases of the Tea bush. III. Root diseases and tree stumps.**—*Tea Quart.*, ix, 3, pp. 101–107, 1936.

In this further paper on tea diseases [cf. *R.A.M.*, xv, p. 747] the author discusses the spread of root diseases from dead stumps. In

Ceylon the pathogenic fungi normally associated with dead tree stumps are *Fomes noxius* and *Ustulina zonata*; *Poria hypolateritia* and *Rosellinia arcuata* [ibid., xv, p. 686] rarely originate on stumps in old tea. The cost of removing all stumps from a new clearing is considered prohibitive and consequently appropriate measures must be taken when outbreaks of root disease occur; where the latter two diseases are predominant the removal of all stumps has relatively little significance, whereas if the former two are prevalent it is important. The danger involved from very old stumps is probably negligible.

Van der Weij (H. G.). **De bodem als infectiebron van Rotterdam-B disease.** [The soil as a source of infection by Rotterdam B disease.] —*Vlugschr. Deli-Proefst. Medan*, 61, 6 pp., 1936.

Conclusive evidence was afforded by experiments undertaken in consequence of a serious outbreak of Rotterdam B disease among newly planted tobacco in Serdang, Sumatra, in which up to 70 per cent. infection spread to adjacent plantings within 11 days, that the virus may be conveyed from one site to another through the soil [*R.A.M.*, xv, p. 686]. Like mosaic, Rotterdam B disease is transmissible from infected to healthy plants by the hands of workmen, and the task of dealing with infested plots should therefore be assigned to special individuals, who should wash their hands in a 5 per cent. formalin solution before proceeding to other work. Seed-beds containing infected plants should be cleared away, together with the surrounding beds, but where sporadic cases appear in the field it is sufficient to eradicate the diseased plants themselves; in the event of mass infection in the plantation, however, total eradication and replanting are indicated.

Holmes (F. O.). **Comparison of derivatives from distinctive strains of Tobacco-mosaic virus.**—*Phytopathology*, xxvi, 9, pp. 896–904, 1 fig., 1936.

Yellow mosaic strains isolated from 31 Turkish tobacco plants previously infected with the distorting strain virus [*R.A.M.*, xv, p. 533] showed considerable variations in 'invasiveness' (capacity to invade and affect the younger leaves of infected plants) and other characters. Thus, 23 out of the 31 may be described as fully invasive, systemic, yellow-type strains, capable of puckering the young leaves and distorting the tips of those at the top of the plant at the time of the onset of mottling. Another five strains produced systemic infections, but did not cause puckering or distortion, while three caused localized symptoms only. Thirteen out of 22 yellow-type strains isolated from tobacco plants infected by the masked strain virus [ibid., xvi, p. 66] were capable of systemic spread through the same host, but none showed a high degree of invasiveness. In general, the invasiveness of the yellow strains derived from the masked strain virus underwent no change during the processes of reisolation and storage in cellophane tubing. The extent to which virus strains transmit their characters to variants arising from them is not known, but in this case the uninvasive character of the masked strain (manifest at its isolation from the

invasive distorting strain) was retained by the yellow type derivatives from it. Changes to yellow mosaic type and to invasive type appear to be independent and may be comparable with unit differences in genetic structure of plants and animals.

KLEBAHN (H.). **Versuche über das Wesen der Mosaikkrankheit des Tabaks und über einige andere Viruskrankheiten.** [Experiments on the nature of the mosaic disease of Tobacco and on some other virus diseases.]—*Phytopath. Z.*, ix, 4, pp. 357–370, 2 figs., 1936.

The fact that cyanic acid, potassium cyanide, silver nitrate, ether, and chloroform failed to weaken two samples of the tobacco mosaic virus to which they were applied in appropriate concentrations in tubes, whereas the bacteria in the solutions were destroyed, is considered to favour the theory that the former is an inanimate substance such as an enzyme [*R.A.M.*, xi, p. 256; xvi, p. 69]. After three years the samples were capable of infecting tobacco plants.

Negative results were given by attempts to induce chlorosis in green *Abutilon sellovianum* plants by contact with variegated *A. striatum* or *A. thompsoni*, union being effected by clamping together the cut surfaces of the stems for six days; in previous tests a successful outcome was obtained by five or six repetitions of the operation at six- to seven-day intervals [ibid., xi, p. 257].

Positive results were obtained in the inoculation of anemones with an extract of the soil adhering to the rhizomes of plants suffering from alloiophylly [loc. cit.], as well as with the powder from dried leaves.

A mosaic disease of cucumber (records of which from Germany could not be traced) [but see ibid., xiii, p. 416] was observed near Hamburg in July, 1934, and was shown by inoculations on four plants (two of the Spot Resisting variety and one each of Blaus Erfolg and Deutscher Sieger) to be transmissible by sap.

[illegible] (M.). **Il marciume radicale del Tabacco.** [Root rot of Tobacco.]—*Boll. tec. Tab.*, xxxiii, 3, pp. 111–114, 5 figs., 1936. [English summary.]

The writer summarizes the position with regard to the occurrence and control of root rot of tobacco (*Thielavia* [*Thielaviopsis*] *basicola*) in Italy [*R.A.M.*, xiii, p. 276; xv, p. 613], whence it was first reported in 1897. The principal remedies against root rot consist in the establishment of seed-beds on such naturally sterile soils as pozzolana (volcanic ash) or sand, or on burnt field soils, and the cultivation of resistant varieties, such as Salento, Meticcio di Cava, Giant Kentucky, and Moro di Pontecorvo (Kentucky types), Guiseppina and Burley di gran reddito [heavy-yielding], corresponding to the recently introduced Burley, and Marca B (Virginia Bright).

PITTMAN (H. A.). **Downy mildew (blue mould) of Tobacco and its control by means of benzol and other volatile hydrocarbons.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 3, pp. 368–380, 4 figs., 1936.

In the first part of this paper the author gives a concise account of the symptoms and economic importance of downy mildew of

tobacco (*Peronospora tabacina*) [*R.A.M.*, xvi, p. 65] in Western Australia, together with a brief reference to the Australian experiments on the control of the disease by benzol and toluol vapours in covered seed-beds [ibid., xv, p. 756]. In the second part details are given of experiments in 1935–6 which were carried out at Manjimup and in the Fremantle area, Western Australia, in which the action was tested of benzol, petrol, and X3 Solvent, the last-named being a benzol substitute (with boiling-point between 90° and 110° C.), marketed by the Shell Oil Co. of Australia. In spite of the very rainy season, no trace of the disease was observed in the covered beds that had been treated with any one of the three hydrocarbons, whereas the seedlings in most of the control beds were entirely destroyed by the fungus which, at Manjimup, had been artificially introduced into both the treated and untreated seed-beds. The vigour and uniformity of the seedlings from the treated beds were in marked contrast to those of the untreated plants and this superiority was maintained right up to harvesting, even though downy mildew was abundant in the field.

Kretchmar (H. H.). **An apparatus for the application of benzol to Tobacco seed-beds.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 3, pp. 380–383, 1 diag., 1936.

The author briefly describes and figures an apparatus for rapidly and easily filling the containers placed in tobacco seed-beds with benzol, for the control of downy mildew of tobacco [*Peronospora tabacina*: see preceding abstract]. The benzol is delivered from the container through a ball release operated by a plunger from the top. In an experimental trial it was found possible to fill 50 seed-bed containers in five minutes, without the operator having to stoop.

West (J.). **Leaf curl of Tobacco in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xiii, 9, pp. 242–244, 5 figs., 1 graph, 1 map, 1936.

Tobacco leaf curl [*R.A.M.*, xv, p. 425], first recorded in Nigeria on experimental plots of Virginian tobacco in 1923, practically ruined a crop planted out early in June, 1935, though a late crop in the same year averaged under 1 per cent. infection. In inoculation experiments by means of the tobacco white fly [*Bemisia* sp.] carried out in collaboration with F. D. Golding, adults from diseased tobacco were fed on five seedlings grown singly in tins containing soil not sown to tobacco for ten years and covered with lamp glasses, four of the seedlings being inoculated with 25 adults each and one with 50. Each of the five inoculated plants showed typical symptoms after one month, though the seven controls remained unaffected. Attempts to inoculate healthy *Vernonia* [ibid., xv, p. 118] cuttings were unsuccessful.

In south-western Nigeria, the native method of growing tobacco during the late rains gives sound control of leaf curl, as the white fly population has begun to decline rapidly by the time the seedlings are transplanted. Infection can, therefore, be serious only in the nursery, where, at present, it appears to be absent. If a more intensive cultivation is undertaken in this locality, the precautions advocated in East Africa will probably have to be adopted [ibid., xiv, p. 678].

Goidànich (G.). **Ricerche sulle 'Phytophthorae' del Pomodoro. I. La Phytophthora parasitica Dast. sul Pomodoro.** [Researches on species of *Phytophthora* attacking Tomato. I. *Phytophthora parasitica* Dast. on Tomato.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 115–138, 1 pl., 14 figs., 1936.

This account of the author's investigations into the tomato collar rot caused in Italy by *Phytophthora parasitica* is an expanded version of a paper already noticed from another source [*R.A.M.*, xv, p. 691]. A sterile variant of the fungus proved much more virulent than the original strain.

Goidànich (G.). **Comportement parasitaire particulier de la 'Phytophthora infestans' De By.** [Abnormal parasitic behaviour of *Phytophthora infestans* De By.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 9, pp. 165–168, 1936.

During the spring of 1936, tomatoes growing in different parts of central Italy developed stem infection by *Phytophthora infestans* on an epidemic scale. Early in May, a scorched lesion appeared, almost invariably in the upper half of the stem, which was girdled by affected tissues, resulting in the rapid dying-off of the tops of the plants. Before the plants withered, the mycelium progressed along the petioles and produced injury similar to that on the stems, the affected leaves wilting at once. Frequently the initial attack occurred at the top of the plant, destroying the buds and affecting flowering. The diseased parts were covered by a white, shining mycelium with numerous zoosporangia, and all the affected tissues were completely invaded. No lesions appeared on the leaf margins. The author considers that the unusual site of the infection indicates that the fungus was in all probability a physiologic form quite distinct from that which attacks the leaves [cf. *R.A.M.*, xv, p. 405]. Further investigations are to be made to elucidate this point.

Huelsen (W. A.). **New wilt-resistant Tomato varieties for field and greenhouse.**—*Circ. Ill. agric. Exp. Sta.* 448, 20 pp., 8 figs., 1936.

Notes are given on the origin, productivity and other characters, and uses of eight tomato varieties resistant to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*] bred at the Illinois Agricultural Experiment Station during the last ten years [*R.A.M.*, xiii, p. 218] and recently released to the public. Three (Prairiana, Early Baltimore, and Illinois Pride) are suitable for the field, and the other five (Blair, Sureset, Urbana, Lloyd, and Long Calyx) for the greenhouse only.

Doolittle (S. P.) & Alexander (L. J.). **Injury to greenhouse Tomatoes as a result of combined infection with the viruses causing Tomato and Cucumber mosaic.**—*Phytopathology*, xxvi, 9, pp. 920–923, 2 figs., 1936.

Greenhouse tomatoes in Ohio and Colorado were severely damaged in 1935 by a disease due to combined infection with ordinary tomato mosaic (Johnson's tobacco virus 1) [*R.A.M.*, xv, pp. 181, 532] and cucumber mosaic (Doolittle's cucumber virus 1) [cf. ibid., xiv, pp. 473, 534], the losses from which amounted to thousands of dollars. The plants were abnormally short (3 to 4 ft.) on 30th May, some six months

after planting, and compact, the leaves just below the growing point being characterized by an upright, bushy habit, due in part to very short internodes and partly to an excessively twisted and erect development of the petioles. The young leaflets were curled, distorted, thick, with yellow veins, and occasionally showed the filiform 'shoestring' malformations liable to affect tomatoes attacked by cucumber mosaic, while the older ones were sharply rolled upwards at the margins and exhibited a mild, yellowish-green mottling similar to that caused by ordinary tomato mosaic. Many of the leaves were of a peculiar greenish-purple, especially along the veins and on the under side, while some also showed large, yellow, bleached-looking spots and a russet-coloured necrosis bordering the larger veins. The flowers were commonly malformed and abortive, but some fruit was produced which was deeply ridged and when small showed a characteristic pointed protuberance at the blossom end.

Tomato plants inoculated with juice from diseased material developed the typical symptoms of the combined virus disease as described above. The cucumber virus was readily separated from the accompanying tobacco virus by direct inoculations on cucumber, and the latter virus was separated from the former by heating to 82° C. In Ohio the cucumber mosaic infection was traced to a neighbouring field of muskmelon [ibid., xiv, p. 811], while in Colorado it apparently originated on cucumbers in another part of the greenhouse. Aphids seem to have been present in large numbers in both States.

Best (R. J.). **Studies on a fluorescent substance present in plants. I. Production of the substance as a result of virus infection and some applications of the phenomenon.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 3, pp. 199–213, 5 figs., 1936.

When a Blue Pryor tobacco leaf with primary lesions of tomato spotted wilt [*R.A.M.*, xv, p. 404] is examined under filtered ultra-violet light from a quartz mercury-vapour lamp with a range between 3,000 and 4,200 Å, the affected areas are seen to be surrounded by brightly fluorescent haloes extending into the apparently healthy green mesophyll and spreading radially outward as the spot develops. The fluorescence is caused by a water-soluble, relatively stable organic substance present in small amounts as a normal constituent of healthy tobacco plants but produced in much larger quantities as a result of virus activity.

Systemic invasion of inoculated tobacco leaves by the spotted wilt virus is shown by bright fluorescent areas, and the effect has been applied to trace the movement of the virus in the leaf. The virus appears to travel to the leaf by way of the vascular bundles, into the mid-rib, along the lateral veins, thence into the smaller veins, and ultimately out into the mesophyll.

The fluorescent substance was also produced round primary tobacco mosaic lesions, spotted wilt lesions on *Nicotiana glutinosa*, *Petunia hybrida*, potato leaves, and occasionally on tomato leaves, but never on nasturtium (*Tropaeolum majus*) leaves [cf. ibid., xv, p. 444]. A close parallel seems to exist between the abundance of the fluorescent substance in healthy plants and the severity of spotted wilt infection.

Tobacco plants systemically infected with ordinary mosaic show only a faint fluorescence in the pale green areas of mottled leaves, while tomato foliage similarly infected does not contain the substance in demonstrable amounts. The fluorescent reaction was experimentally shown to develop in plants injured in various ways, and is therefore not specific for the tomato spotted wilt virus.

Best (R. J.). **The effect of light and temperature on the development of primary lesions of the viruses of Tomato spotted wilt and Tobacco mosaic.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 3, pp. 223–239, 6 graphs, 1936.

Under constant conditions of light and temperature, the curves relating the number of tomato spotted wilt and tobacco mosaic lesions [see preceding abstract] on Blue Pryor tobacco and *Nicotiana glutinosa*, respectively, to time were found to be sigmoid and to approach limiting values. The limiting value for both virus-host combinations was 30 per cent. higher at 20° than at 15° C. when the light factor was kept constant. The time interval between inoculation and the time of maximum rate of appearance of lesions varies with temperature, and at constant temperature appears to be a constant for any one virus-host combination. The interval was found to be 50 per cent. longer at 15° than at 20° for mosaic lesions on *N. glutinosa*, and 60 per cent. longer for spotted wilt lesions on tobacco. The time taken by the spotted wilt lesions to attain their maximum rate of appearance was 60 per cent. longer than that for mosaic at 20° and 50 per cent. at 15°. Sunlight, and to a much slighter extent, artificial light, exerted an inhibitory action on the development of spotted wilt lesions on tobacco.

Whipple (Otis C.). **Spotted wilt of Garden Pea.**—*Phytopathology*, xxvi, 9, pp. 918–920, 1 fig., 1936.

The inoculation of expressed juice from peas affected by streaking of the stems and a spotted brown necrosis of the leaves in a greenhouse at Wisconsin University in 1934 into tobacco, tomato, aster [*Callistephus chinensis*], nasturtium [*Tropaeolum majus*], *Nicotiana glutinosa*, *Datura stramonium*, and *Emilia sagittata* induced typical symptoms of tomato spotted wilt [see preceding abstracts]. Characteristic streak [*R.A.M.*, xi, p. 218] symptoms developed in 12 out of 18 Yellow Admiral pea plants inoculated by rubbing with juice from Calla lily [*Zantedeschia aethiopica*] leaves from California infected by spotted wilt [ibid., xiv, pp. 212, 725], and in 4 out of 16 inoculated by Stubbs's tissue-insertion method [ibid., xv, p. 551], the use of a carborundum abrasive [ibid., xv, p. 737] greatly facilitating infection. Of 105 Yellow Admiral, Alaska, and Alderman plants inoculated by rubbing, 33 showed typical streak symptoms. Of 192 healthy pea plants to which infective individuals of *Thrips tabaci* were transferred from two lots of nasturtiums, one infected by streak and the other by spotted wilt, 43 contracted streak in a typical form and all six attempts to recover the virus from the diseased plants were successful. Seventeen out of 27 pea blossoms on which viruliferous insects were caged set pods, and symptoms developed on six, from which the virus was readily reisolated.

Under the conditions of these tests the incubation period of the virus ranged from 7 to 20 days. The stem streak is purplish- or bluish-brown and may extend only slightly beyond the point of inception or cover the whole length of the stem. A histological examination of infected stems revealed general necrosis of the parenchymatous cells, including the phloem. Unilateral development of the affected parts is common, and other symptoms include an occasional mottling of young leaves, irregular, wavy, concentric patterns over the necrotic areas of the pods, associated with *Thrips* feeding, and rarely necrotic spots or patterns on the seeds.

The spotted wilt virus, being widely distributed, is thought to be undoubtedly a causal factor in pea streak. Symptoms resembling those described above were observed in the field at Madison in 1935 on pea plants artificially inoculated with the spotted wilt virus, which was further recovered from badly diseased plants in a streak epidemic in two widely separated nurseries in the same year.

Meier (K.) & Grampoloff (A. V.). **L'action des rayons ultra-violets sur l'entreposage des denrées périssables.** [The action of ultra-violet rays on the storage of perishable commodities.]—*Annu. agric. Suisse*, xxxvii, 9, pp. 951–977, 4 figs., 11 graphs, 1936. [German summary.]

Cultures of *Cladosporium lycopersici* Plowr., *Botrytis cinerea*, and *Penicillium glaucum* isolated from tomato fruits were generally destroyed by 12, 10, and 40 minutes' exposure, respectively, to ultra-violet rays generated by a mercury-vapour lamp 'Gallois', with continuous current, Henri George burner, 220 volts, 2·5 ampères, at a distance of 21 cm. In certain instances, however, even longer durations of illumination failed to sterilize the cultures, probably on account of the presence of buried spores in the agar. Discontinuous irradiations were less potent than a single exposure of the requisite duration. Tomatoes inoculated with the above-mentioned fungi were similarly exposed, with the result that the growth of *P. glaucum* was completely arrested after 40 minutes irradiation, while that of *C. lycopersici* was only retarded after 15 to 20, and the internal development of the mycelium of *B. cinerea* precludes absolute sterilization.

A series of experiments are described on the effect of irradiation on the storage of fresh fruit the results of which showed that the treatment consistently reduced the rotting due to micro-organisms. In one experiment with tomatoes, for instance, irradiation for 30 seconds and 1 minute of each tomato each day reduced rotting (by *B. cinerea* and *C. lycopersici*) from 11·2 per cent. in the untreated control to 6·2 and 6·3 per cent., respectively, after 17 days, and from 97·5 to 76·8 and 63·0 per cent. after 43 days. In another similar experiment irradiation for 1 minute 7 seconds per day per tomato reduced loss (chiefly from *C. lycopersici*) from 14·8 to 7·2 per cent. after 20 days storage, and from 65·8 to 43·4 per cent. after 31 days. The incidence of *B. cinerea* on strawberries was diminished by discontinuous irradiation for 4 minutes 15 seconds each day, the best result being given in the variety '7/2' in which the loss after 16 days was 9 per cent. as against 61·9 per cent. in the control. The invasion of peaches by *Monilia* [*Sclerotinia*],

Penicillium, and *Clasterosporium* [*?carpophilum*] was similarly reduced by treatments for 5 minutes 40 seconds each day, from 28·9 per cent. rotted after 22 days to 13·1 and 9·0 per cent. (in two sets of fruit) and from 59·2 to 36·8 and 41·5 per cent., respectively, after 45 days.

Hirt (R. R.). **Observations on the production and germination of sporidia of Cronartium ribicola.**—*Tech. Publ. N.Y. St. Coll. For.* 46, 25 pp., 8 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, p. 508, 1936.]

Under the meteorological conditions prevailing at Warrensburg, New York, teleutospore age was found to affect sporidium production in *Cronartium ribicola* [*R.A.M.*, xvi, p. 74]. Direct contact with water was not essential for, though highly stimulatory to, teleutospore germination, but relative humidities of 96 to 100 per cent. were necessary at 12° to 16° C. From 12° to 18° was the optimum range for sporidial production, the minimum and maximum being 0° to 1° and 21°, respectively. The teleutospores were still viable after eight hours' exposure to direct sunlight, but the time required for sporidial formation was increased. Sporidia were expelled with sufficient force to carry them for an average horizontal distance of 266 μ. Germination was effected both by the production of secondary sporidia and by the development of true hyphae, the particular type being largely determined by temperature. Direct sunlight affected the sporidia adversely, but otherwise they remained viable for eight hours on warm, clear days under natural conditions.

Groves (J. W.). **Ascocalyx abietis and Bothrodiscus pinicola.**—*Mycologia*, xxviii, 5, pp. 451–462, 1 pl., 2 figs., 1936.

The author states that in 1934 *Ascocalyx abietis* [*R.A.M.*, v, p. 520] was collected on lower dead branches or fallen trees of *Abies balsamea* in the Temagami Forest Reserve, Northern Ontario, in close association with fruiting bodies of *Bothrodiscus pinicola* Shear, and that the genetic connexion of these two fungi was established in pure cultures. In a taxonomic discussion good evidence is adduced showing that *A. abietis* is closely related to *Crumenula abietina* [ibid., xii, p. 667] and *C. pinicola* [ibid., xv, p. 618], but it is thought inadvisable to transfer it to *Crumenula* on account of the uncertain status of this genus. It would appear that the nomenclatural type of *Crumenula* is not congeneric with *C. pinicola* and related species, and that, therefore, the name *Ascocalyx* is valid for the fungus studied by the author, and probably also for the species included in *Crumenula* in the sense of Rehm, who considers *C. pinicola* as the type. Revised descriptions are given, based on Canadian material, of *A. abietis* and its imperfect stage which has also been known as *Fusisporium berenice* Berk. & Curt. 1875, *Cenangium pithyum*, *Scleroderris pityæ*, and *Pycnocalyx abietis*.

Shear (C. L.) & Davidson (R. W.). **The life histories of Botryosphaeria melanops and Massaria platani.**—*Mycologia*, xxviii, 5, pp. 476–482, 5 figs., 1936.

The authors report the occurrence of *Botryosphaeria melanops* on red

oak (*Quercus borealis*) in 1935 in Connecticut, a new record for the United States, and single ascospore cultures showed *Dothiorella advena* Sacc. to be the imperfect stage. *Massaria platani* Ces. was found in Washington, D.C., fruiting abundantly around a branch stub on a sycamore tree [*Platanus occidentalis*] while *Hendersonia desmazieri* Mont. developed freely on the outer edges of a diffuse canker on the stem of the same tree. The genetic relationship of the two stages was established by the fact that single ascospore cultures of the former produced pycnospores of the latter after five to seven weeks growth on malt agar at about 24° C. The pycnospores thus produced were more irregular in shape and size than those produced in nature, which were 4-celled and measured 44 to 52 by 17 to 20 μ. The ascospores of *M. platani* were mostly 6-celled and 58 to 68 by 14 to 16 μ.

Campbell (A. H.) & Munson (R. G.). **Zone lines in plant tissues. III. The black lines formed by Polyporus squamosus (Huds.) Fr.**—*Ann. appl. Biol.*, xxiii, 3, pp. 453–464, 2 pl., 1936.

Polyporus squamosus [*R.A.M.*, xv, p. 620], a wound parasite of dicotyledonous trees, with apparently little power of direct attack on living wood, was isolated from black lines inside the wood of an elm, near Bristol, bearing sporophores of the fungus. In culture on artificial media it formed loose, cottony aerial mycelium with marked aggregations of hyphae which developed into whitish-yellow pseudoparenchymatous papillae 0·5 to 1·5 by 0·3 to 0·6 mm., usually in rows between the agar and the glass. The function of the papillae is unknown. Black plates, or lines as they appear in section, were observed after five or six weeks and were produced by the fungus in sterilized blocks of poplar, sycamore [*Acer pseudoplatanus*], pear, elm, beech, ash, and oak wood. In a discussion of the structure and formation of these lines, it is suggested that, as in the case of *Armillaria mellea* [ibid., xiii, p. 483], they form the limiting layer or rind of sclerotium-like bodies (pseudosclerotia) buried in the attacked wood. Club-shaped bodies interpreted as abnormal fructifications occurred in culture on wood blocks on which oidia were also produced by fragmentation of the hyphae into chains of cells 8 to 30 by 4 to 10 μ in diameter. The paper terminates with a review of the formation and structure of sclerotia in several species of *Polyporus*, which are compared with the pseudosclerotia of *P. squamosus*.

Hopp (H.). **Appearance of Fomes igniarius in culture.**—*Phytopathology*, xxvi, 9, pp. 915–917, 1936.

Out of 50 cultures of *Fomes igniarius* [*R.A.M.*, xv, pp. 63, 199] from decayed wood of *Populus tremuloides*, 41 stained the malt agar deep mummy-brown and produced little or no aerial mycelium, while the remaining nine induced a more or less conspicuous bleaching of the medium and formed a profuse antimony-yellow to Dresden-brown aerial mycelium. Homothallic cultures derived from mycelium growing in wood and from spores also produced both types of growth. No indication was afforded of any genetic differences between the two types and the factor implicated remains unknown.

Sastri (B. N.). **Physiology of the spike disease of Sandal.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 444–449, 1936.

Reviewing the biochemical data existent on the spike disease of sandal [*R.A.M.*, xiv, p. 802] the author concludes that in affected plants the equilibrium between starch and its products of hydrolysis is disturbed; the products of hydrolysis accumulate and this leads to the accumulation of starch. The disappearance of nitrates after the attack has not yet been explained; it is suggested that they may be reduced to nitrates, which at once react with amino-acids, to produce hydroxy acids. Succinic, malic, and oxalic acids [ibid., xiv, p. 538] and mannitol (of which the last has not been recorded in any other virus-affected plant) are present in spiked leaves as a result of changed respirational activity, the oxygen uptake being about half, and the oxidase and peroxidase activities about double, those of healthy leaves. The accumulation of these acids is due to the small calcium concentration of the affected tissue, which hinders their neutralization or removal by precipitation.

Hilborn (M. T.). **The calorific value of decayed cordwood.**—*Phytopathology*, xxvi, 9, pp. 905–914, 1 graph, 1936.

The effect of fungal decay, due to *Polyporus* [*Polystictus*] *hirsutus* [*R.A.M.*, xii, p. 740], *P. pergamenus* [ibid., xvi, p. 4], *Panus stipticus* [ibid., xiv, p. 270], *Stereum purpureum* [ibid., xvi, p. 3], *Thelephora* sp., and *Daldinia* sp., on the specific gravity and calorific value of red maple (*Acer rubrum*), paper birch (*Betula* [*alba* var.] *papyrifera*), and beech (*Fagus grandifolia*) [*F. ferruginea*] in two situations (woods and open field) in Maine was measured over a four-year period with the object of testing whether calorific determinations can be utilized in evaluating fungal decay. The specific gravity and calorific value of the wood (air-dried) showed a parallel decline, denoting a change in chemical composition. Correcting the calorific value for water-content, which increased with the extent of decay, the net fuel value was found to decrease during the four-year period by up to 89·4 per cent. for the unsplit birch from the woods compared with only 35·9 per cent. for the unsplit red maple from the field. Some of the birch wood showed a decline of 50 per cent. of the fuel value in less than two years.

Red-flowered Gums. Control of canker disease.—ex *W. Australian*, 17 September, 1936.

In this summarized report on investigations carried out in Western Australia by H. A. Pittman on the cause and control of canker disease of red-flowered gums [*Eucalyptus ficifolia* and *E. calophylla*] it is stated that the causal organism has been isolated, and that numerous inoculation experiments carried out during a period of two years with this fungus leave no doubt as to its being the cause of the disease. In every case the inoculated trees became infected while the uninoculated remained healthy, many of the former succumbing in six months. A very few resistant types were found, and it is considered that in future only such trees should be planted. Pending the discovery of methods of vegetative propagation, it is recommended that badly affected trees

should be destroyed by burning, and all infected parts removed from trees otherwise healthy, the wounds made being painted with Bordeaux paste or thick white lead. The stems and leaves of young trees planted near older, diseased ones should be sprayed several times during the wet season (on fine days) with home-made Bordeaux mixture 4–4–50.

Scheffer (T. C.). **Progressive effects of Polyporus versicolor on the physical and chemical properties of Red Gum sapwood.**—*Tech. Bull. U.S. Dep. Agric.* 527, 46 pp., 2 pl., 1 fig., 12 graphs, 1936.

A detailed study of the decay of red gum (*Liquidambar styraciflua*) sapwood caused by *Polyporus* [*Polystictus*] *versicolor* [*R.A.M.*, x, p. 149 and above, p. 106] showed that the fungus caused a uniform thinning of the cell walls, indicating the production of enzymes capable of affecting the wood substance in advance of the hyphae. The characteristic bleaching effect was found to be due to a destruction of semi-soluble pigments.

Reduction in the specific gravity of the wood was delayed 8 to 10 days after inoculation, but subsequently losses in weight were largely proportional to the length of the incubation period. The effect of the decay was initially to lower all the strength properties listed (except those indicated by modulus of elasticity, fibre strength at, and work to, proportional limit) more rapidly than the specific gravity. The three tests excepted were tardy in responding to the decay, making trends in early losses obscure. After the initial stages of decay had been passed, all the strength properties were reduced more rapidly than the specific gravity. The values for all of them approached zero considerably in advance of the point of complete wood consumption, and were, for the most part, lower than those of sound wood of the same specific gravity. As indicators of incipient decay, work to maximum load and total work beyond maximum load were outstanding. The most dependable indicators of extent of decay were modulus of rupture and maximum crushing strength.

The chief effects on chemical composition were as follows. The relative proportions of the principal wood components were not materially altered. The lignin, pentosans not in cellulose, cold water-soluble, and 1 per cent. alkali-soluble components were first attacked, while the Cross and Bevan cellulose, pentosans in cellulose, and strictly hot water-soluble portions remained little affected until part of the wood substance had been consumed. In the earlier stages of decay the cellulose depletion was represented by losses in both the stable and unstable forms, while in the latter the stable cellulose consumption was more pronounced.

It is suggested that the initial reduction in strength was due to the removal or alteration of small amounts of cell wall lignin and soluble carbohydrates which had cemented the fundamental cellulose units together.

Lohwag (A.). **Mykologische Studien. XI. Poria obliqua (Pers.) Bres.** [Mycological studies. XI. *Poria obliqua* (Pers.) Bres.]—*Öst. bot. Z.*, lxxxv, 4, pp. 270–278, 6 figs., 1936.

In these further studies the writer describes and discusses the morphological features of *Poria obliqua*, found on a maple in the Vienna

Botanic Garden [*R.A.M.*, xv, p. 329], comparing his observations with those of von Höhnel on the same fungus and tracing analogies between *P. obliqua* and other Polyporaceae. The author has constantly detected *P. obliqua* on the trunks of thoroughly sickly trees and doubts its capacity to initiate decay.

Riccardo (S.). **Secondo contributo sperimentale per lo studio delle alterazioni interne delle Castagne.** [A second experimental contribution to the study of internal spoilage of Chestnuts.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 1–14, 2 pl., 1936.

Continuing his investigation into the infection of chestnuts destined for export [*R.A.M.*, xiv, p. 801], the author found that after the hot-water treatment some developed mould (*Penicillium glaucum*) on the external surface of the pericarp. Many chestnuts with soft, blackish flesh showed, in addition, internal infection by a fungus whose chief characters agreed with those of *Rhizopus nigricans*. The internal spoilage of chestnuts with white, soft, and cheesy flesh appeared to be due principally to an apparently undescribed species of *Micrococcus* and a bacterium of the *Bacterium* [*Bacillus*] *coli commune* group. The water used for treating chestnuts almost constantly contained yeasts and frequently showed the presence of bacteria of the *B. coli commune* group.

Servazzi (O.). **Nuove ricerche sulla preservazione dalle muffe delle Castagne disinfestate con la immersione in acqua a 50° C. per 45 minuti.** [New researches on the preservation from moulds of Chestnuts disinfected by immersion in water at 50° C. for 45 minutes.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 3–4, pp. 31–45, 1936.

Further investigations are described into the various factors affecting mould formation on or in Italian chestnuts submitted to hot-water treatment before export [see preceding abstract]. On the basis of inoculation experiments through various types of wounds with *Penicillium crustaceum* the author concludes that lesions made during harvesting, selecting, washing, and drying have no effect on mould development, since these do not penetrate the whole thickness of the pericarp. Immersion in cold water for 24 to 72 hours before applying the hot-water treatment did not improve the keeping qualities of the chestnuts.

Investigations on the chemical nature of the flesh of different varieties failed to reveal any relationship between composition and mould resistance. It was ascertained that immersion in water at 50° C. for 45 minutes stimulated the enzymatic processes and altered the carbohydrate : nitrogen ratio of the chestnuts; this, it is considered, must exercise an adverse effect on resistance to infection.

Montgomery (H. B. S.). **A study of Fomes fraxineus and its effects in Ashwood.**—*Ann. appl. Biol.*, xxiii, 3, pp. 465–486, 1 pl., 4 figs., 1 graph, 1936.

After noting the hosts on which *Fomes fraxineus* [*R.A.M.*, vi, p. 200] has been recorded in literature, the author gives a tabulated account of morphological and physiological studies of a strain of the fungus

isolated from a living locust (*Robinia pseud-acacia*) tree in England. In pure culture on malt agar *F. fraxineus* developed a snow-white growth, which later became pale pinkish-brown and then wood-brown, and after three weeks bore pore-surfaces sometimes extending almost over the whole of the culture. The aerial hyphae were about 2 μ in diameter, and the submerged, septate hyphae with many clamp-connexions varied in diameter from 1 to 4 μ. Numerous chlamydospores were formed, 10·5 to 19 by 9 to 10·5 μ (average 13 by 10 μ) in diameter. In culture the oval pore orifices varied from 0·19 to 0·39 by 0·14 to 0·28 mm. in diameter and the oval basidiospores measured 4 to 7·5 by 3 to 6 μ (average 4·4 by 4 μ). Single-basidiospore cultures were found to be heterothallic, sex being apparently determined by two factors. The optimum temperature for growth was about 26° C., with a maximum at 33°; growth was very slow below 10°. The optimum hydrogen-ion concentration was Ph 6. The enzymes present were diastase, emulsin, invertase, zymase, pectinase, catalase, oxidase, peroxidase, and lipase.

In tests on blocks of ash, the fungus caused an initial temporary high loss in weight of the sapwood (apparently correlated with the presence of starch in the wood), but not of heartwood or intermediate wood. After four months the interior of the block was extensively rotted and crumbly, with a typical 'brash' fracture. The fungus was able also to attack beech, oak, Sitka spruce [*Picea sitchensis*], and Scots pine [*Pinus sylvestris*], generally softening the wood, which sometimes showed a tendency to divide into fibres. Special tests showed that the fungus is only moderately resistant to zinc chloride, sodium fluoride, and coal-tar creosote, and could be fairly readily controlled by their use.

Sumstine (D. R.). **Oriental Plane tree disease.**—*Science*, N.S., lxxxiv, 2176, p. 247, 1936.

Platanus orientalis in various localities of Pennsylvania is liable to infection by a mildew forming a white, floccose layer over part or whole of the leaf surface. The fungus was described in *Mycologia*, v, p. 58, 1913, and is identified by J. A. Stevenson as *Oidium obductum* Ell. & Langl. originally recorded on oak from Louisiana and on *Platanus* from West Virginia. Salmon (*Ann. mycol., Berl.*, iii, p. 493, 1905) regards *O. obductum* as a variety (*angulata*) of *Phyllactinia corylea* [*R.A.M.*, xiii, p. 128]. Further studies are necessary to determine the exact systematic position of the mildew.

Goidànich (G.). **'La moria dell'Olmo' (Graphium ulmi).** [Elm die-back (*Graphium ulmi*).]—136 pp., 44 figs., Rome, Ramo Editoriale degli Agricoltori, 1936. Price L. 10.

In this book the author concisely summarizes in semi-popular terms the information at present available on Dutch elm disease, caused by *Ophiostoma* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 692]. The work is divided into four main sections dealing with (1) the species of elm grown in Italy, (2) the geographical distribution of the disease, its symptoms, transmission, and reproduction by inoculation, (3) the morphological, cultural, physiological, and biological characters of the

fungus, and (4) control by the use of resistant varieties. A bibliography of 93 titles is appended.

SWINGLE (R. U.). **A preliminary note on sexuality in Ceratostomella ulmi.**—*Phytopathology*, xxvi, 9, pp. 925–927, 1936.

Some 2,000 monoconidial isolates from mass isolates of *Ceratostomella ulmi* [see preceding abstract] from the Dutch Elm Disease Laboratory, Morristown, New Jersey, were tested for perithecial formation by growing them singly and in combination on sterilized elm twigs. Monoconidial isolates did not form perithecia, whereas crosses of some from different mass isolates did so. Mono-ascospore isolates repeatedly produced the *Graphium* stage in culture. An American elm [*Ulmus americana*], inoculated with a suspension from a mono-ascospore isolate, developed typical Dutch elm disease symptoms in a fortnight, and the *Graphium* stage of the fungus was recovered from the tree. Mono-ascospore isolates formed no perithecia, which were produced, however, by certain crosses in 9 to 42 days. Both monoconidial and mono-ascospore isolates frequently produced strikingly aberrant variants or sectors, in 75 of which from one mono-ascospore isolate the sexual characteristic of the parent culture either remained unchanged or the capacity for perithecial formation, but not for conidial production, was lost.

TEHON (L. R.) & JACOBS (H. L.). **A Verticillium root disease of American Elm.**—*Bull. Davey Tree Expert Co.* 6, 32 pp., 2 pl., 13 figs., 1936.

American elms (*Ulmus americana*) in the Ohio Valley are affected by a disease involving dwarfing, flaccidity, wilting, and chlorosis of the leaves, an abnormal production of abscission layers, striation and discoloration of the cambium, and death of the smaller roots, the cortex of which is readily detachable.

Of the 172 isolations secured from diseased roots, 43 per cent. belonged to a new species of *Verticillium* [*R.A.M.*, xiv, p. 203], *V. rhizophagum*, 11·7 to *Fusarium* (?) *solani* var. *martii* [ibid., xv, p. 339], and 6·9 each to *Sphaeropsis* and *Sclerotium*; the first-named was the only one obtained with sufficient consistency to suggest a pathogenic relationship, the existence of which was established by inoculation and reisolation experiments on seedlings and two-year-old trees. *V. rhizophagum* grew well on potato dextrose and malt agar at 23° C.; it is characterized by terminal, hyaline, spherical chlamydospores, 7·5 to 11·5 μ (average 10 μ) in diameter, occurring singly or in chains of two or three; variable conidiophores ranging from short, simple, hyphal branches, 2 to 7 by 1 to 1·5 μ, to verticillate structures, the verticils consisting of 1 to 7, commonly 4 branches, 12 to 20 μ in length; and oval to somewhat lunate conidia 2·5 to 5·5 by 1·5 to 3·6 μ.

The results of anatomical and histological studies indicate that the disturbance is essentially a parasitization and destruction of the cambium and most recently formed xylem and phloem, the death of the first-named certainly, and of other tissues possibly, taking place in advance of the fungus. The wood rays tend to grow for some time after the death of the cambium, but they finally succumb and, in the phloem region, undergo disorganization; by their agency the organism

is radially distributed through the root tissues, while elsewhere it passes laterally from cell to cell through simple and bordered pits. Tyloses develop in profusion within the invaded region, accompanied by the deposition of gum, tannin, and other protective substances, in the same or earlier rings, while minor changes in the xylem include separation of the tertiary thickening of the walls of wood cells, abundant accumulations of starch grains, development of callosities, and formation of mycelial pockets.

The Destructive Insect and Pest Act (Canada) and regulations thereunder.—*Acts, Orders & Regulations* No. 8 (3rd revised edition), 36 pp., 1936.

This revised edition gives details of plant disease legislation and regulations now in force in Canada [*R.A.M.*, iii, p. 239]. Reference may be made to Regulation 22 (Foreign) effective as from 10th June, 1936, which prohibits the importation of lily bulbs from Japan and her dependencies unless certified disease-free and as originating in fields free from virus diseases at the second inspection.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Notice of lifting of Quarantine No. 7 (foreign) White-Pine blister rust.—1 p., 1936.

The revocation, effective as from 1st September, 1936, of Quarantine No. 7, white pine blister rust [*Cronartium ribicola*] and its amendments Nos. 1 and 2, promulgated in 1913, 1916, and 1917, respectively, automatically places the entry into the United States of white pines, currants, and gooseberries under the provisions of Notice of Quarantine No. 37 [*R.A.M.*, xv, p. 752], the terms of which will permit the importation of these plant species in accordance with the restrictions of the Domestic White Pine Blister Rust Quarantine No. 63 [ibid., xiv, p. 544].

Bermuda Byelaws made by the Bermuda Board of Agriculture on 28th April, 1936, under the provisions of The Boards Act, 1929. Control of plant diseases and pests.—3 pp., 1936.

These Byelaws prohibit (apart from a specific insect quarantine) the importation into Bermuda of all parts of *Musa* spp., except the fruit, all parts of *Citrus* spp., except the fruit, from the West Indies and Bahamas, *Ipomoea* plants and tubers, Irish potatoes from Great Britain, Ireland, Europe, Newfoundland, St. Pierre, and Miquelon, raw or untreated carrots, all parts except the loose grain of maize, broom corn [*Sorghum bicolor* var. *technicus*], and other sorghums, and all parts except the flower and seed of *Lilium* spp. Special permits are required for the importation of banana fruits if wrapped, covered, or packed, of all parts of *Narcissus* spp., except the flower, and of all soil and plants growing therein.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*NachrBl. dtsch. PflSchDienst*, viii, 4, pp. 103–107; 5, pp. 128–130; 6, pp. 140, 142–147, 155–158, 1936.

Germany (Oldenburg and Lübeck). Orders dated, respectively, 9th May and 29th June, 1936, define the regulations governing the

activity of co-operative seed-grain disinfection establishments [*R.A.M.*, xvi, p. 24] in Oldenburg and Lübeck [cf. ibid., xi, p. 707]. Similar regulations were issued on 20th August, 1936, in respect of Mecklenburg.

Argentina. By regulations dated 3rd June, 1936, the importation into the Argentine Republic of plants and parts thereof is permitted only if accompanied by properly authenticated health certificates. All material is subject to inspection at the port of entry, and if infested by a parasite not known to be present in Argentina must either be disinfected, or, if this is impracticable, returned to the place of origin within ten days, or burnt. Consignments of potatoes for seed or consumption must further be accompanied by a guarantee that the site of cultivation and a surrounding 500 m. zone are free from *Synchytrium endobioticum* and *Spongospora subterranea*. Seed potatoes showing more than 5 per cent. (by weight) infection by *Actinomyces scabies*, *Rhizoctonia* [*Corticium*] *solani*, *Spondylocladium atrovirens* [ibid., xiv, p. 223], or physiological disorders, as well as those with any proportion of virus diseases [ibid., xv, p. 823] or invaded by any pathogen not present in the country, will be refused admission. In the case of potatoes for consumption an incidence of up to 10 per cent. (by weight) of tubers infected by *A. scabies*, *C. solani*, and *S. atrovirens* is permissible. The entry of European vines is limited to those intended for use as scions on American stocks.

Peru. Under the terms of regulations published in *Sanid. veg. Min. Agric. Peru*, pp. 13–25, May, 1936, seeds and plants may be imported (subject to the usual safeguards) from foreign countries only by way of Callao and Iquitos and the post office of the latter place and Lima: the conveyance of seeds, plants, fresh fruit, and fresh vegetables by air [cf. ibid., xiv, p. 736] and in the diplomatic bag is prohibited.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 10, pp. 225, 227, 1936.

Federated Malay States. Under Notification No. 3659 of 23rd August, 1935, all plants and parts thereof belonging to certain genera and species (*Hevea*, *Gossypium*, *Coffea*, with the exception of dry berries, sugar-cane, *Camellia sativa*, &c.), shoots of all banana varieties (*Musa sapientum*), *Elaeis* fruits, coco-nut fruits, and all living parts of pineapple (except fruits from the Dutch East Indies), intended for importation into Malaya must be accompanied by official certificates of freedom from diseases and will be subject to inspection and, if necessary, to appropriate treatment before entry [cf. *R.A.M.*, vi, p. 448]. Permission to import must be obtained beforehand and importation should take place through the port of Swettenham or by post through the Agricultural Adviser or Chief Field Officer.

Morocco. A Decree of 1st August, 1936, defines the sanitary measures applicable to potatoes, tomatoes, and eggplants imported into the French zone of the Sherifian Empire with a view to the exclusion of *Synchytrium endobioticum*.

Dominican Republic. A Regulation of 24th May, 1935, prescribes the procedure to be followed for the importation of plants, seeds, bulbs, and the like into the Dominican Republic. Imports are liable to inspection, and, if necessary, are placed in quarantine or destroyed.